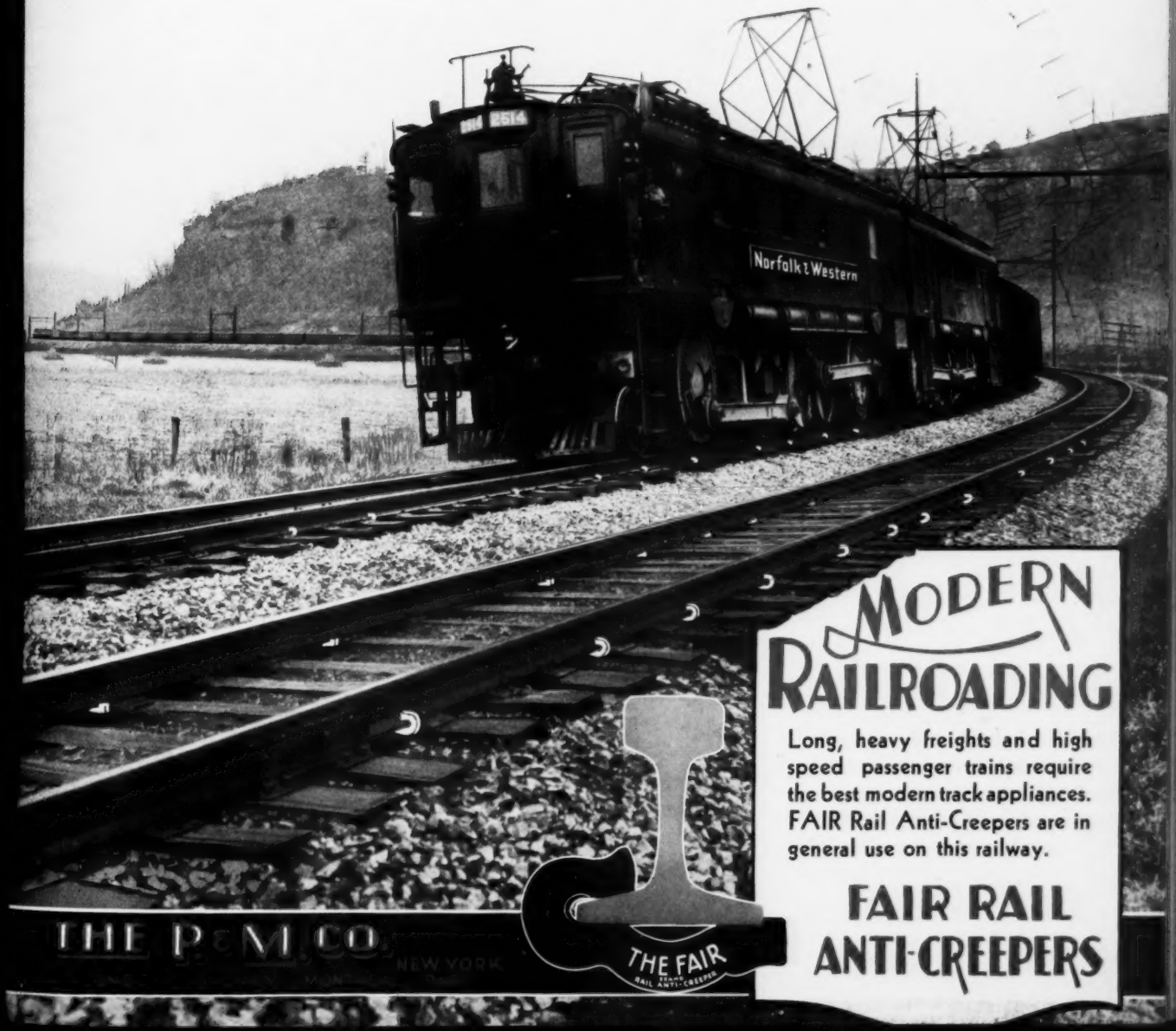
WINTER WORK NUMBER

Railway Engineering and Maintenance

November, 1931

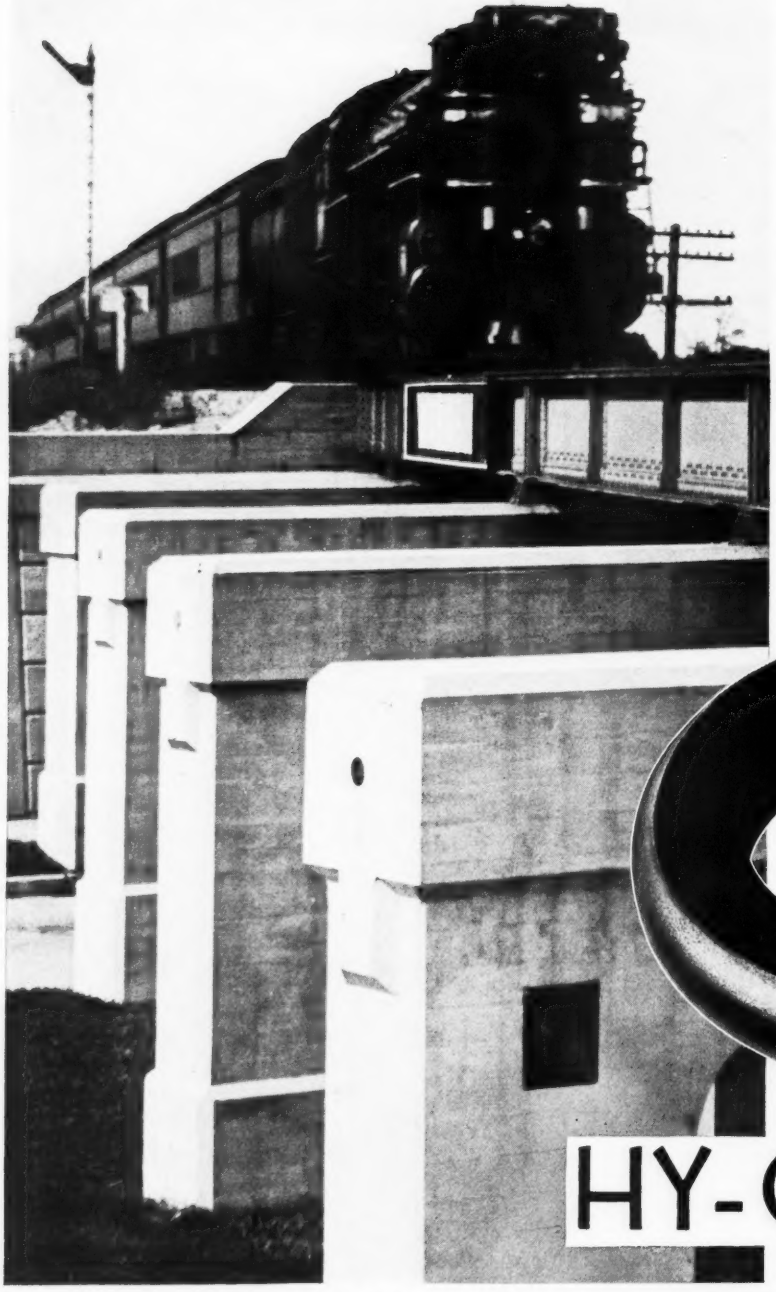


MODERN RAILROADING

Long, heavy freights and high speed passenger trains require the best modern track appliances. FAIR Rail Anti-Creepers are in general use on this railway.

FAIR RAIL ANTI-CREEPERS

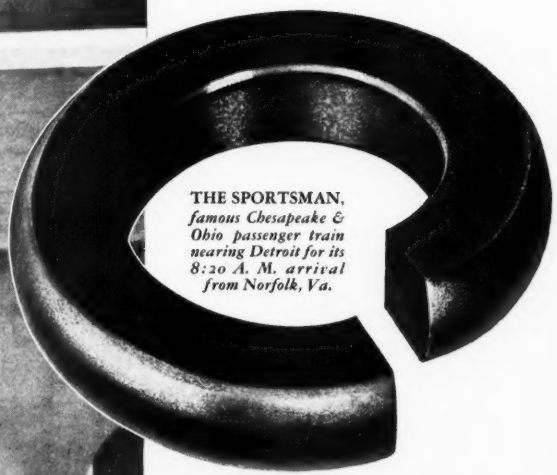
. . . Still pioneering helical *spring washer development . . .*



HIGHER SPEEDS for heavier loads were needed if dividends were to be paid. Heavier equipment and better maintenance were demanded by faster service and greater tonnage. Facing these facts HY-CROME spring washers were engineered to meet present day requirements.

Fifteen years ago—*as now*—HY-CROME spring washers offered maintenance engineers the most economical, non-fatiguing and efficient automatic compensation for joint wear, under all traffic conditions. HY-CROME has always insured bolted efficiency.

THE
RELIANCE MANUFACTURING CO.
MASSILLON, OHIO
Engineering Materials, Ltd., McGill Bldg.
Montreal, Quebec, Canada



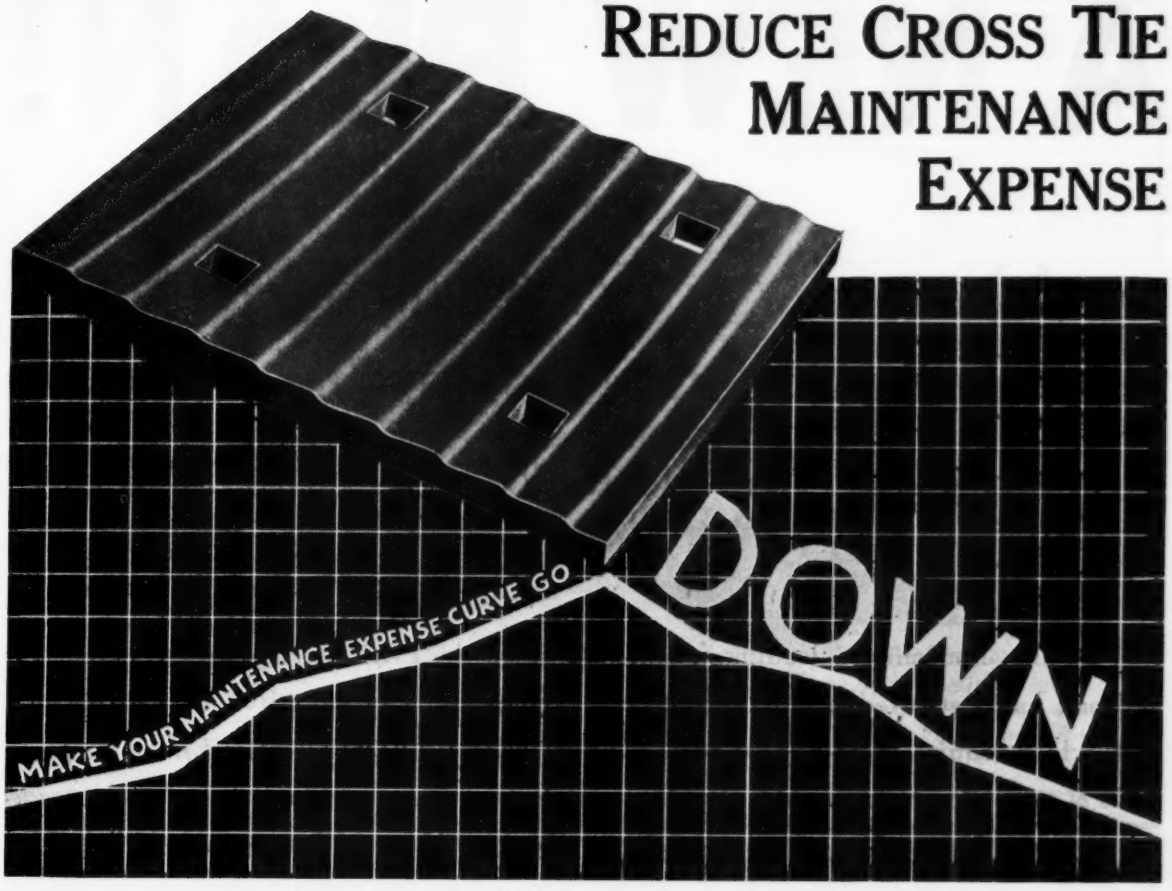
THE SPORTSMAN, *famous Chesapeake & Ohio passenger train nearing Detroit for its 8:20 A. M. arrival from Norfolk, Va.*

HY-CROME
Reg. U. S. Pat. Office

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 2200 Port Washington Road, Milwaukee, Wisconsin. Subscription price: United States and Mexico, $2.00; Canada, $2.50 including duty; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter February 14, 1931, at the postoffice at Milwaukee, Wisconsin, under the Act of March 3, 1879.

Alphabetical Index to Advertisers, Page 1008 Classified Index to Advertisers, 1004-1006

REDUCE CROSS TIE MAINTENANCE EXPENSE



Insure Maximum Tie Life and Minimum Tie Renewals

RAILROADS using Lundie Tie Plates are now reaping big benefits in the form of reduced tie renewals. These roads have a decided advantage during the present economic crisis—because they have reduced their annual tie renewals year after year to a point where they are now realizing worth-while savings in cross-tie maintenance expense.

The savings accruing from Lundie Tie Plates are cumulative. They get bigger and bigger each year as more Lundie Plates are placed in track and consequently tie-renewals become fewer and fewer. The tie-renewal curve and the tie-maintenance expense curve are definitely downward.

The Lundie Tie Plate gives superior service because it is more than just a tie plate—it is a tie protector. The complete elimination of sharp tie destroying projections protects ties against mechanical wear and assures 100 per cent service-life from treated ties. Millions in service prove this.

Low first cost and assured returns make this an economic device of the highest order.

The Lundie Engineering Corporation

285 Madison Avenue, New York
59 East Van Buren Street, Chicago

LUNDIE TIE PLATE

A NEW PLAN!

▼ ▼ ▼

A New Idea in Track Maintenance—already in operation—shows the Fairmont M19 to be the ideal car for Patrolmen

▼ ▼ ▼

In effecting economies, a leading western railroad has instituted a new Patrol system, which requires nearly *thirty thousand miles of travel a year* for each car!

When you consider what is required of an inspection car in making *seventy to one hundred mile schedules every day* you can realize what is demanded in the nature of *reliability and easy riding qualities* such as only the FAIRMONT M19 can deliver.

The improved spring mounting of frame —larger springs with 50% longer travel— make the FAIRMONT M19 the ideal car for long inspection trips.

The FAIRMONT M19 *has ample power to buck strong head winds and heavy grades with a windshield.* It is not only light enough for one man to handle but roomy and powerful enough to accommodate four men and tools, when necessary. Windshield and side seats can be readily applied for added comfort.

Ask us for complete specifications and illustrated bulletin 284, which will be gladly sent to you upon your request.

Fairmont Mudge
Performance on the Job Counts

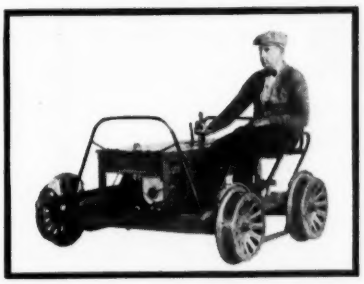
FAIRMONT RAILWAY MOTORS, INC.
FAIRMONT, MINNESOTA, U. S. A.
General Sales Offices: 1356 Railway Exchange Building, CHICAGO
District Sales Offices:
New York City Washington, D. C. St. Louis San Francisco
FAIRMONT RAILWAY MOTORS, Ltd., Toronto, Canada
Foreign Representative: THE BALDWIN LOCOMOTIVE WORKS
Manufacturers of section motor cars, inspection motor cars, gang and power cars, weed burners, mowers, ballast discers, ball and roller bearing engines, push cars and trailers, roller axle bearings, wheels, axles and safety appliances

OVER HALF THE RAILWAY MOTOR CARS
THE RAILROAD WORLD

THE FAIRMONT M19
A new and vastly improved Fairmont car for inspection and light maintenance work. Seats 1 to 4 men.

13 WAYS IMPROVED!

THE NEW FAIRMONT M19 INSPECTION CAR

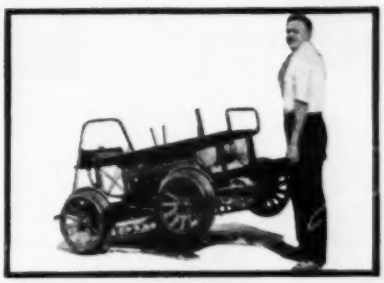


"She Rides Like a Baby-Buggy"

is the comment of one Inspection Man. Always an easy rider, the new M19 has an improved, complete spring mounting of frame—more durable, and conserves the rider's energy for better work every hour of the day.

By every standard of judgment the new M19 is a finer, faster, more powerful, comfortable and *useful* Inspection Car than any previous Fairmont models. Chief among the improvements are:

1. More powerful engine—eight full horsepower, 50% increase on former maximum.
2. Four-wheel brakes, Raybestos lined shoes.
3. Two larger, square-cornered, flat-bottom trays, 14x50½".
4. Stronger, all-steel frame.
5. Improved spring mounting of frame, larger springs with 50% longer travel, more durable.
6. Long starting crank, safely supported.
7. Rail skids standard equipment.
8. Absolutely freeze-proof cooling system with capacity for severest conditions.
9. Single choke and needle valve control on seat.
10. Aluminum piston and connecting rod which stands up: wonderfully smooth-running.
11. Easily removable cylinder head.
12. Long-sleeve Axlsaver axle bearings with thrust collars easily adjustable on car, with ordinary wrench.
13. Larger load capacity, 750 lbs.



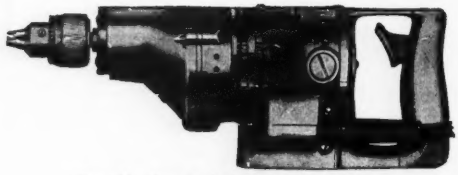
Only a 138 Pound Lift

That's all the effort it takes for the M19 with 14" wheels. The standard model with 17x1¼" wheels has a total weight of 597 lbs. There are lighter Fairmont cars—the 59 (500 lbs. standard) and the MM9 (410 lbs. standard)—if weight is of first consideration.

NOW IN USE ARE FAIRMONT PRODUCTS

K N O W S F A I R M O N T

Let Electric Tools Do The Hard Work and Speed Up Your Jobs



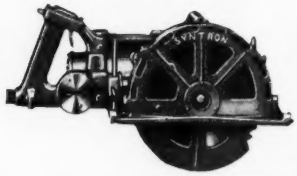
Portable electric drill, built in capacities for drilling steel from ¼ to 1½ inches. Also to drill wood with augers.

Flood light for lighting construction jobs or wrecks, built in different capacities up to 1000 watts.

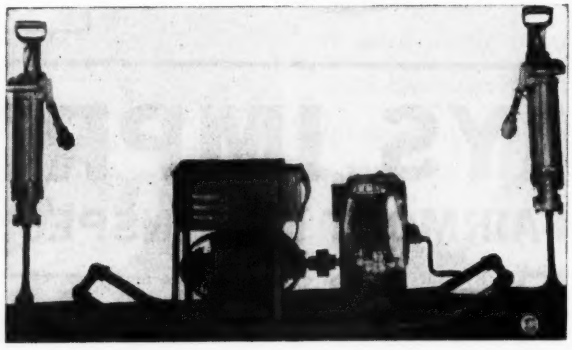
Portable electric grinder for grinding rail, switch points, etc. Built in two sizes with a 4 inch wheel and a 6 inch wheel.

Portable electric clay spading hammer for digging clay and shale, hardpan, etc.

Portable electric scaling hammer for scaling paint and rust from metal, weight 9 pounds.

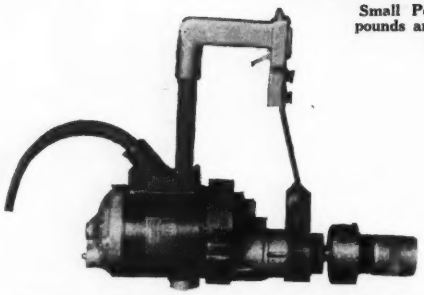


Portable electric power saw. Saws are built in different capacities including 2, 3, 4 and 5 inch cutting capacities.

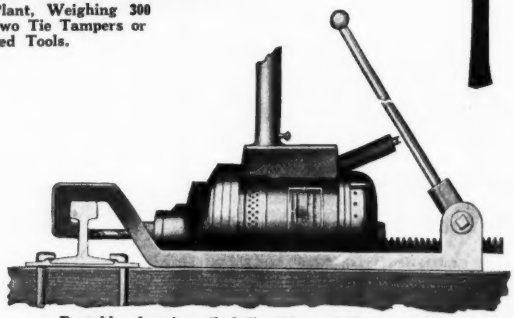


Small Portable 3 KVA Power Plant, Weighing 300 pounds and Capable of operating Two Tie Tampers or any two of the Illustrated Tools.

Portable electric concrete hammer drill, built in different sizes with drilling capacities from ½ inch hole up to 2 inch holes.



Electric nut tightening wrench for running nuts up on rail joint bolts. This wrench is reversible and can also be used to run nuts off old bolts.



Portable electric rail drill with a drilling capacity of 1¼ inches. Clamp is adjustable to different sizes of rail.

SYNTRON COMPANY

General Offices:
PITTSBURGH, PA.

Manufacturers of High Grade Portable Electric Tools and Portable Power Plants

On Crutch— or crawler?

WILL your next shovel, crane or dragline limp around the curves with power on only one crawler, or will it be a Northwest?

The Northwest patented crawler base maintains *full* power on both crawlers even while turning. It is this greater tractive power that enables it to negotiate the roughest terrain, climb out of narrow ditches, cross rails regardless of its position, and travel up ramps or from car to car without danger.

A machine that won't go where you want it won't earn profits.

Let us tell you more about it!

Northwest Engineering Company

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

1713 Steger Building — 28 East Jackson Boulevard
Chicago, Ill., U. S. A.

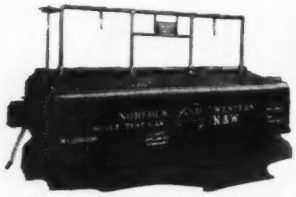
It's not a question of a long or short curve. It's a question of traction and the tread trail of the Northwest simply illustrates that it walks with both feet.

NORTHWEST

The Most Progressive Railroads *have adopted* SOUTHWARK SCALE TEST CARS

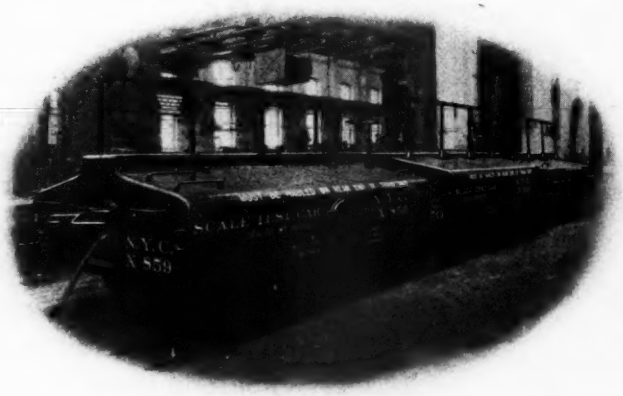
as standard equipment

Detroit, Toledo & Ironton R. R. Co. (Ford Transportation Co.)



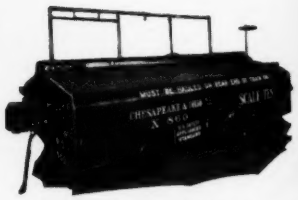
Norfolk & Western Ry. Co.

Morgan's Louisiana & Texas R. R. (Southern Pacific Lines).

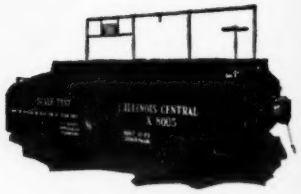


Southwark Scale Test Cars are designed to comply with requirements of test cars in use by the Bureau of Standards, Department of Commerce, but also embody many improvements such as one-piece body, air brakes, spring equalization, etc.

Wabash Ry. Co.



Chesapeake & Ohio Ry. Co.



Illinois Central R. R. Co.

Some of the Railroads Using Southwark Test Cars

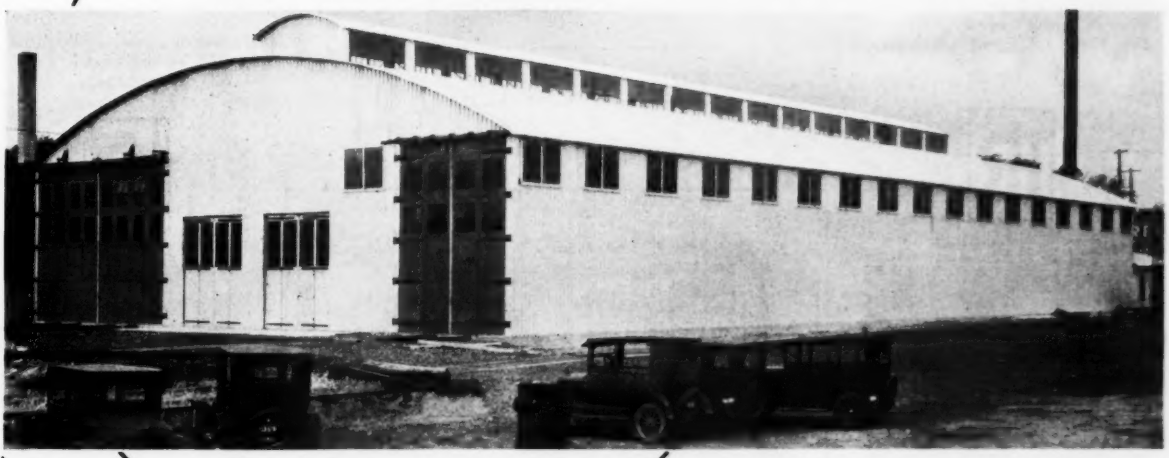
		Capacity, Pounds			Capacity, Pounds
Illinois Central R. R. Co.	1	80,000	Barney Machinery Co., Inc.	1	80,000
Norfolk & Western R. R. Co.	2	100,000	Union Pacific	1	80,000
Southern Pacific R. R. Co.	1	80,000	M. K. & T. Railroad	1	80,000
Chesapeake & Ohio R. R. Co.	2	80,000	Northern Pacific	1	80,000
Southern Pacific Lines	1	80,000	Tennessee Coal & Iron Co.	1	100,000
Wabash Railway Co.	1	80,000	Tennessee Coal & Iron Co.	1	50,000
Kansas City Southern Ry. Co.	1	80,000	New York Central R. R.	2	80,000
Detroit T. & I. R. R.	1	80,000	Southern Ry. Co.	3	80,000
Illinois Central R. R. Co.	1	80,000	Southern Pacific Co.	1	80,000
New York Central Lines	1	50,000	E. Ferro Central de Brazil	1	88,000 (40 Metric Tons)
New York Central Lines	1	100,000	Missouri Pacific R. R.	1	80,000
Atlantic Coast Line R. R. Co.	1	80,000	Great Northern Ry.	2	80,000
Reading Co.	1	100,000	New York Central Ry.	6	80,000
Chicago & Northwestern Ry. Co.	1	80,000	Hocking Valley Ry.	1	80,000

BALDWIN SOUTHWARK CORPORATION-SOUTHWARK FOUNDRY & MACHINE CO. DIV.

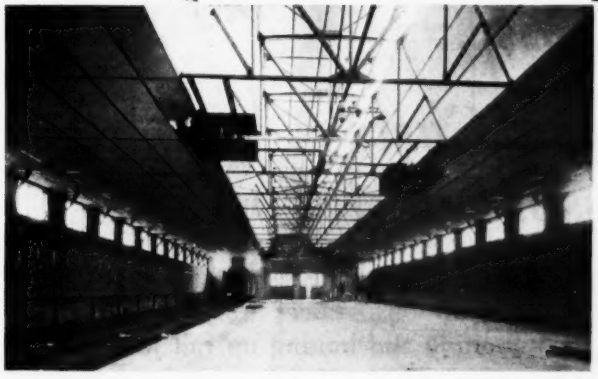
SOUTHWARK
PHILADELPHIA

MADE ENTIRELY OF STEEL

BUTLER



READY-MADE STEEL BUILDINGS



At the top right is a photograph of the structural steel frame which carries the C. B. & Q. Fruit House. Its members are designed to give the greatest strength per pound of steel and fabricated in units such as to facilitate quick assembly. The large photograph shows the finished building with the panel corrugated wall and roof sections bolted into a finished exterior. The special Butler panel corrugation multiplies sheet steel strength fourfold over ordinary corrugating. The interior view above the inside insulation is accomplished with a commercial wall board. Insulation and heating facilities are such as to maintain a 50 degree temperature in coldest weather.

Protect Perishable Railway Cargoes

The Chicago, Burlington and Quincy Railway has economically solved the problem of unloading and handling car load fruit at Minneapolis with the large Butler Ready-made steel building pictured here.

With a span of 90 feet, a height of 22 feet and a length of 200 feet, it shelters freight car tracks and a double drive truck loading platform extending through the building.

105 stationary and 66 large ventilating type steel window sash daylight the interior. A 24x24 foot boiler house shelters the heating equipment. Approximately 150 tons of steel were utilized in the manufacture of this mammoth fruit house. By way of contrast a small scale house is pictured below at the left. The adaptability of Butler Ready-made, standardized unit design has a full range between these two extremes in railway structures. Butler engineering service will supply you with full details and prices on any size and type of building now under consideration, be they scale houses, track car houses, material depots, freight depots, car repair shops, material treating plants, machine shops, truck and bus garages, signalmen shelters, transformer houses, power houses, et cetera. Railway construction and railway maintenance departments both Save With Steel in Butler Ready-made, standardized unit design structures. We shall be glad to demonstrate with our proposals.

BUTLER MANUFACTURING COMPANY

1247 Eastern Ave. KANSAS CITY, MO.

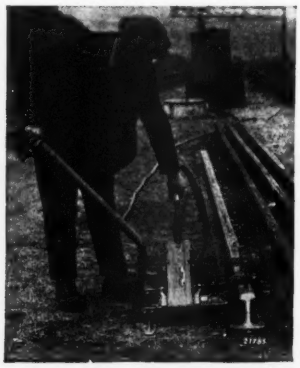
MINNEAPOLIS, MINN. 947 Sixth Ave., S. E.

Send complete information on Butler Ready-made Steel Buildings, particularly a building approximately ..... ft. by ..... ft., to be used for .....

Firm Name .....

Address .....

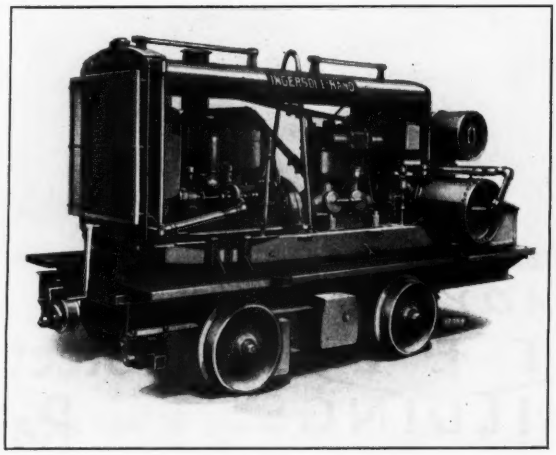
Bolting-up rail joints with No. 99c Wrench in one-fourth the time of hand methods.



Drilling a rail in 25 to 30 seconds with No. 90 Rail Drill.

Boring a screw spike hole in 5½ seconds with CCW Woodborer.

Pulling 10 spikes per minute with No. SP9 Spike Puller.



Ingersoll-Rand Tie Tamper Air Compressor with self-propelling mechanism.

Driving cut spikes in 3½ seconds with CC-250 Spike Driver.

Reduce Rail Laying Costs with I-R Compressors and Tools

Ingersoll-Rand has developed a very complete line of air tools to help speed up the work and reduce costs on rail laying operations. There are pneumatic spike pullers; spike drivers; wrenches for unbolting and bolting up rail joints, rail drills, bonding drills, woodborers, etc.

Used in connection with Ingersoll-Rand Tie Tamper Compressors, they are an effective means of obtaining lower costs.

INGERSOLL-RAND CO. · 11 Broadway · New York City

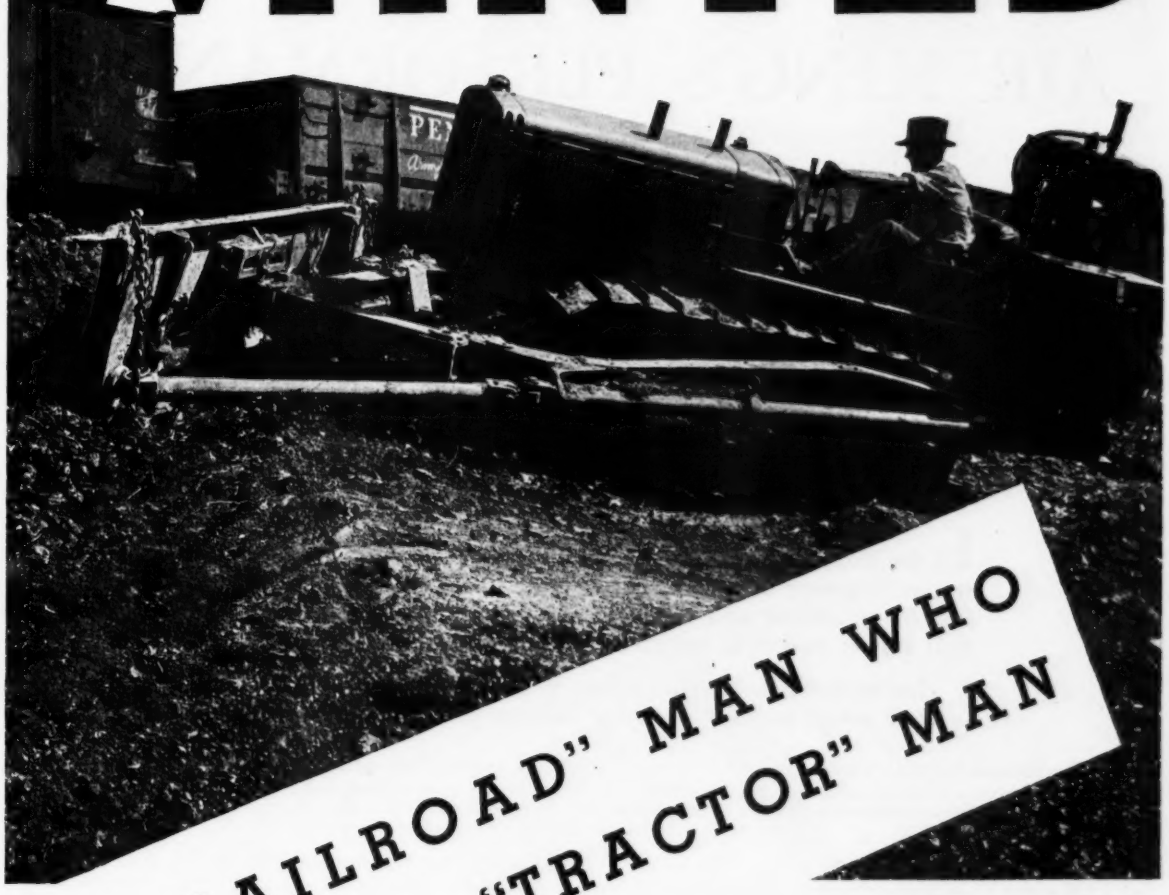
Branches or distributors in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited
620 Cathcart Street, Montreal, Quebec

291-TT

Ingersoll-Rand

WANTED

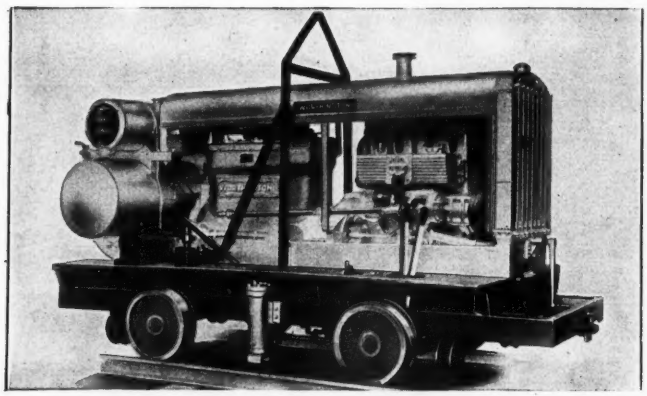


A "RAILROAD" MAN WHO CAN BE A "TRACTOR" MAN

WE HAVE a good job for some man with experience in a maintenance-of-way division. A man who is old enough to have acquired considerable knowledge of the railroad end of the business—and young enough to learn about track-type tractors. A man who has engineering experience—and a sales personality. A man who will thoroughly acquaint himself with the numerous ways "Caterpillar" Tractors are now saving money for many railroads—and then effectively tell that story to the right men in all the railroads. Please tell all about yourself in the first letter.

CATERPILLAR TRACTOR CO., Peoria, Illinois, U.S.A.

THE TEN GUARDSMEN *of the* AIR KING'S PERFORMANCE



IN the Worthington Air King Compressorcar, a mechanical drive transmits power direct from the engine to the wheels . . . eliminating an air motor and reducing the burden on the compressor. Full power makes it possible to climb steep grades with ease.

And here are the ten vital points of the Worthington Compressor Unit which make it a paying investment for railroad work:

- **The famous Feather Valve**
  Steel ribbons . . . new ones cost only 20 cents. The only compressorcar using these flexible, durable valves. *This means economy.*
- **Full force feed lubrication**
  Oil under 30 lb. pressure between all wearing surfaces. No "high bearings" to burn out as with splash system. *This is protection.*
- **Rated at higher speeds**
  Made possible by force feed lubrication, by balancing the flywheel and by counterbalancing the crankshaft. *More reserve power.*
- **Electrically welded frames**
  Extra heavy rolled steel. Blow holes, casting defects or shrinkage strains not possible as with cast steel frames. *Strength and long life.*
- **Flexible coupling**
  Insures against wear should the engine become misaligned. *This is efficiency.*
- **Automatic unloading system**
  Use of separate idling butterfly gives a snap pick-up to the engine before the compressor load comes on. *This is advanced design.*
- **Heavy duty Continental Engine**
  Replacable cylinder liners make reboring and oversize pistons unnecessary. Overhead valves give surplus power. *Accessibility without dismantling.*
- **Cooling water direct from radiator**
  Cooled water from bottom of the radiator is pumped to the compressor before being passed to the engine. *This is common sense.*
- **Low discharge air temperatures**
  Straight line air discharge. The Feather Valve is directly over the piston, not offset in compressor cylinder head. *Aftercoolers unnecessary.*
- **Vibrationless**
  The crankshafts and the flywheel are accurately balanced. *This lowers maintenance.*

COMPRESSORS *Portable and Stationary*	PUMPS *Centrifugal...Steam...Power Rotary...Deep Well*
ROCK DRILLING EQUIPMENT	FEEDWATER HEATERS
Rock Drills	CONDENSERS and Auxiliaries
Contractors Air Tools	METERS *Water...Grease Oil...Gasoline*
Drill Steel and Accessories	DIESEL ENGINES
Automatic Heat Treating Machines	GAS ENGINES
Forging Furnaces	CHROMIUM PLATING
MULTI-V-DRIVES	*Literature on request*

WORTHINGTON PUMP AND MACHINERY CORPORATION

WORKS AT BUFFALO, N.Y. CINCINNATI, OHIO HARRISON, N. J. HOLYOKE, MASS.
Executive Offices: 2 Park Ave., New York, N.Y.
GENERAL OFFICES: HARRISON, N. J.

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Branch Offices or Representatives in Principal Cities of all Foreign Countries

R-80

WORTHINGTON

...may we give you a lift?

If you have loads to lift the Loadmaster will bring your costs down to the new low levels necessary today. This husky, compact, fast-working crane will load and unload trucks and cars; sort and pile stored materials; lift rock, pipe and transformers from and into trenches and manholes; serve machine tools; assist in overhauling and repair work. Auxiliary units such as air-compressor, bulldozer, winch and magnet increase its usefulness. Full-revolving booms, wheel or crawler mountings, no tail swing. ***It will pay you to investigate.***

BUCYRUS ERIE

L-5

LOADMASTER

BUCYRUS-ERIE CO.
South Milwaukee, Wis.

Joint Maintenance Lowered -- -- Track Improved

NORDBERG CROSS GRINDER

"Tight" track, rough track, and battered down joints which need frequent raising—all result when the steel at rail ends "flows," closing up expansion and causing chipped joints.

The Nordberg Cross Grinder removes the surplus metal accurately and speedily. It's a self-contained power machine —easily operated—easily handled—by one man.

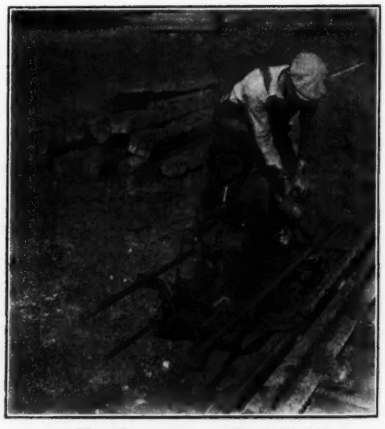
NORDBERG POWER RAIL DRILL

Machine shop precision and power are now available for drilling holes in cut rails, guard rails, switches, etc.

The Nordberg Power Rail Drill clamps firmly to the rail—and drills a true hole quickly at exactly the right height.

Write for literature on these two Nordberg Power Machines.

Nordberg Cross Grinder



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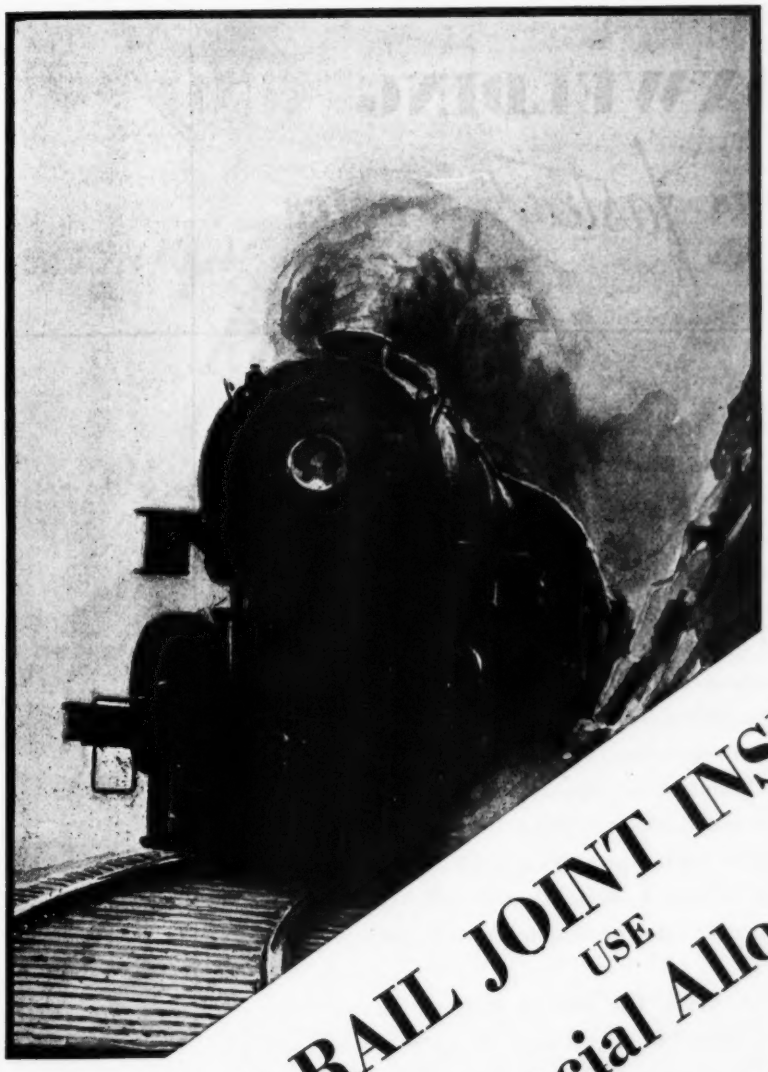

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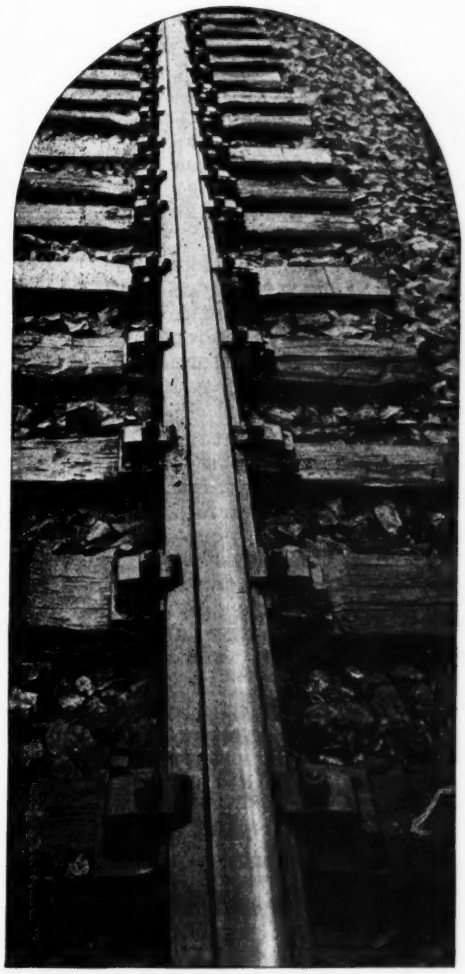

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No. 35 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: The Future of the Railways

October 27, 1931

Dear Reader:

I received a letter from a reader a few days ago that summarizes so aptly the thought of so many railway men today, especially the younger men, that I want to quote part of it.

"There are many young men in railway service today who have studied and worked with the idea of making places for themselves. They have ideals and ambitions and are wholeheartedly railway men. These young men have made progress; with each advancement they have worked a little harder to do their jobs a little better. Then the slump came and down the line they have gone, some of them out.

"These fellows are not whining. They know and understand that retrenchment is necessary. They are willing to step down and do their bit towards improving conditions, but they are depressed. They are wondering whether, with the trucking problem and the rate problem and the thousand and one other problems that beset the railways, the roads will survive. Have they placed their money on the wrong horse?"

This is a not unnatural attitude for an alert young man to take who is not yet too old to make a change in his life work if he concludes that he is heading down a blind alley and that there are greater opportunities elsewhere. But are his doubts well founded? Are the railways becoming a decadent industry? Are the highways, the waterways and the planes to provide the transportation of the future? In short, have the railways gone over the top?

Frankly, I do not think so. After more than 25 years' intimate observation of the railways and their service to the public, I am more than ever convinced of the permanency of their place in our national life. Unless our nation itself disintegrates, our railways cannot go backwards. Rather, as our civilization becomes more complex, comprising an increasing variety of industries, each meshing into the other to produce the necessities and the luxuries of life, transportation becomes steadily more important. One need consider only what would happen to our large cities if our railways should cease to bring in, for only a day, the supplies of milk, food, etc., to say nothing of the fuel, clothing and other necessities.

No, the railways are not headed for the discard, in my opinion. Rather, I believe that they will become more important to our very existence in the years to come. With such a background, the railway industry must continue to attract young men of stamina, intelligence and ability to provide that service that is so essential and to meet the competition that challenges it today.

These are trying days, I confess, and the immediate future does not appear at all clear. Beyond the present fog, however, I am sure that there is a clear period of expanding opportunity for the young man who can and will ride through with the railway with which he has cast his lot.

Yours truly,

Elmer T. Howson

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Editor.

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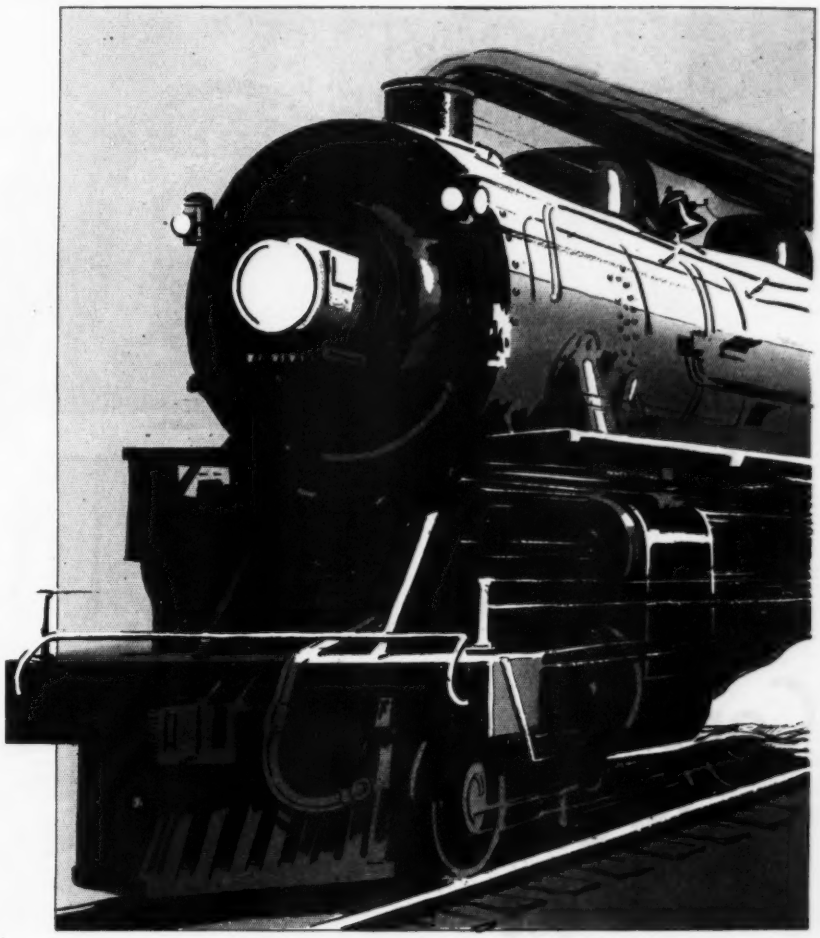

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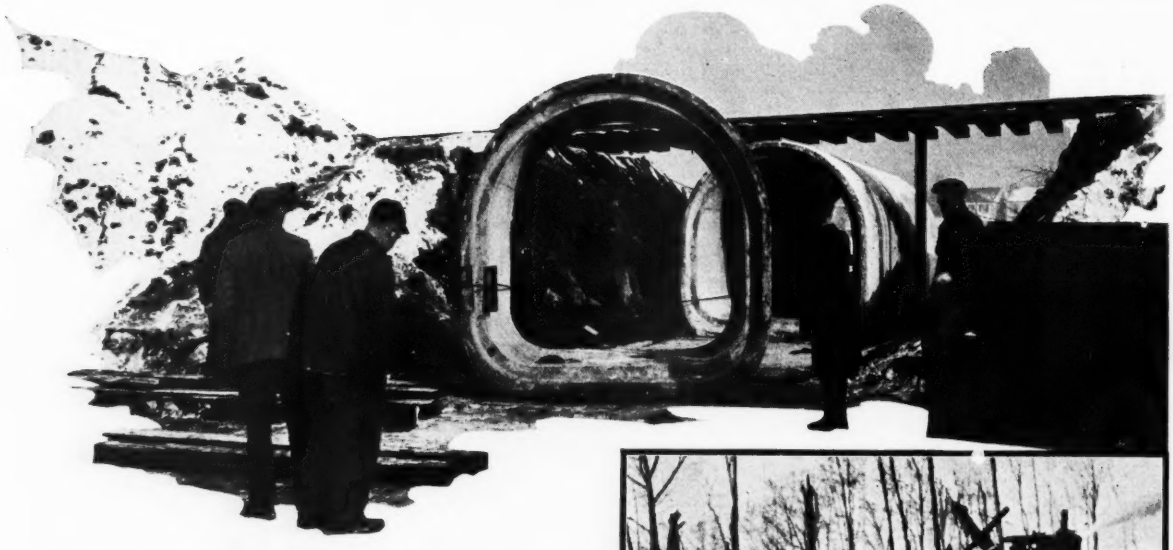

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Railway Engineering and Maintenance

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NOVEMBER, 1931

Editorials - - - - - - - - - - - - 953
Rate Decision — Better Men — Rail Laying — Progress

Organizing to Fight Snow Storms - - - - - - - - 956
Equipment in the hands of trained forces and operated according to carefully prepared programs gives Boston & Maine the upper hand

Keeping Jack Frost Out - - - - - - - - - - 961
E. M. Grime gives a graphic picture of the problems that confront the water service man and shows what can be done to help him

Now You Can Beat a Blizzard - - - - - - - - - 964
Snow fighting devices simplify problems in terminals, where intricate track and switch layouts intensify the effects of severe storms

Keeping Building Forces Busy - - - - - - - - - 968
Several roads, appreciating the value of stable forces, carry out many kinds of work during colder months without difficulty

Keeping the Line Open in Winter - - - - - - - - 972
Armstrong Chinn reviews the measures to be employed prior to and during severe weather to insure continuity of operation

What Bridge Work in Winter? - - - - - - - - - 974
F. H. Cramer says that cold weather imposes no problem for some items but that the case is not so clear for others

Railway Bridge is Removable - - - - - - - - - 976
Structure over gorge in Switzerland, where avalanches are prevalent, is dismantled to avoid winter storms and re-erected for summer use

What's the Answer? - - - - - - - - - - 977

News of the Month - - - - - - - - - - 986

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Railway Engineering and Maintenance

RATE DECISION

A Bitter Disappointment to Roads and Employees

THE Interstate Commerce Commission has handed down its decision on the petition of the railways for a 15 per cent increase in freight rates. This decision is a bitter disappointment to the railways and equally or even more so to their employees. At best, it offers a measure of relief grossly inadequate to meet the needs of the roads. However, even this small aid is offered only on condition that all of it be set aside and given to those roads which are in the direst need—an expedient so socialistic in character as to be of doubtful legality.

Roads Need $500,000,000 Annually

The request of the roads for a horizontal increase in rates, which the commission has rejected, was estimated to swell their revenues by more than $500,000,000 a year. In its stead, the commission suggested specific increases in the rates on coal and other products of mines, on lumber and on numerous products other than agricultural, which it estimated would increase the revenues of the roads from $100,000,000 to $125,000,000, or less than one-quarter of the amount set forth by the roads as necessary to enable them to meet the present crisis.

Still more serious, even this limited relief is to be made available only to those roads that are in the most serious financial straits, for the commission stipulated that it would approve the increases suggested only on condition that the revenues derived therefrom be pooled and used solely for the relief of those roads that are failing to earn their fixed charges. In other words, those roads which, by reason of especially good management or other causes are still able to meet their fixed charges, will derive no immediate benefit from this increase, although their shippers will be taxed therefor. It, therefore, places a penalty on efficiency and a premium on poor management.

Furthermore, it requires the coal producers on the Norfolk & Western, for illustration, to pay that road $3 per car additional for every car of coal that they ship, which sum the Norfolk & Western shall transfer to the pool for use, possibly, by a midwestern road to make good a deficit incurred by reason of inadequate rates received from the transportation of agricultural products. In other words, it requires the coal operators of West Virginia to contribute to the cost of transporting the Montana farmer's grain to market, a procedure which is so socialistic as to be without precedent in the annals of American transportation regulation. Furthermore, it has stipulated that these increases shall be temporary in character and that they shall expire on March 31, 1933.

Adverse Decision Unexpected

This decision was so unfavorable that it took the country by surprise. Up to the hour that it was issued, it was freely predicted that the roads would receive at least half of what they asked for. Discounting such a result, the prices of railway stocks had risen moderately from their low levels of recent weeks, reflecting a more optimistic attitude in many quarters.

The roads based their application for the rate increase on the fact that their net operating income for the first eight months of this year, even after the most drastic retrenchment, yielded a return of only 2.14 per cent on their property investment, or less than 40 per cent of what the commission had itself fixed as a fair return. They pointed out also that even in the boom years of 1928 and 1929 they had not been able to earn this fair rate of return, let alone accumulate any surplus to tide them over periods such as that through which we are now passing. The railways showed also that, in addition to numerous reductions or eliminations of dividends, many of their number are facing the loss of markets for their securities by reason of their inability to maintain earnings sufficient to qualify them as legal investments by savings banks, insurance companies, etc., in the state of New York, the standard commonly accepted by the country as the weasure of investment security.

Two Possible Courses of Action

When the railways went before the commission with their application for an increase in rates, they chose one of two possible courses of action. They could either endeavor to increase their income through higher rates, there being little opportunity to increase the volume of traffic handled under present conditions, or they could look for relief through reductions in costs of operation. The latter in turn offered two alternatives—reductions in wages or retrenchments in other directions.

So far as the latter alternative is concerned, every railway employee knows only too well that the retrenchment has already been most drastic. The elimination of more than 470,000 employees from railway payrolls within the last two years, of whom more than 160,000 have been taken from the maintenance of way depart-

ment, is mute evidence of this. When employees see this retrenchment carried to the point where the track forces of an important line are reduced to foremen who are themselves working only two days a week, rotating on three adjacent sections to enable one to patrol all three sections daily, and when they realize that even with such drastic measures this road is unable to earn its fixed charges, it is evident to them that operating costs have been cut to the point where they cannot long be continued without endangering safety of travel. They know further that much of the saving that is now being made is temporary in character and must be made good at a not far distant date, for the properties are not being adequately maintained today. It is obvious, therefore, that there is little further opportunity for relief through additional retrenchment.

So far as the other possible avenue for reductions in operating costs is concerned, the roads have as yet steadfastly refused to take any action looking to a general downward revision of wages, an attitude that is of vital concern to every employee and one for which they have reason to be thankful. Whether they are to be able to adhere to this position remains to be seen.

What Action Will the Roads Take?

The railways have not as yet announced what action they will take with reference to the decision. They are reported to consider unworkable the plan presented by the commission and have delegated to the Advisory committee of the Association of Railway Executives the task of laying before the commission modifications of the proposed pooling plan to remove at least part of the objections that have been raised. Among the suggestions which are reported as under consideration are (1) that the pool shall be divided into three groups, east, west and south, rather than national, and (2) that any amounts transferred from the stronger roads to the weaker ones be considered in the light of loans rather than outright gifts, thereby conserving ultimately to all roads the returns from the increased rates that are rightfully theirs and, at the same time, placing this additional income, for the time being, at the aid of the weaker roads.

Disappointing as the decision is, it is to be hoped that the commission will give it the most favorable interpretation in order that the railways may secure any help that is possible. That such action means much to every railway employee is obvious.

BETTER MEN

Forces of Higher Standards than Ever Before

IN SPITE of the many problems that now confront the maintenance of way officer, there is one that does not concern him, the labor problem. This is not intended as a facetious comment on nation-wide unemployment and the sore hardships it has brought home to many people. Rather it is designed to direct attention to one important advantage enjoyed by everyone who is responsible for getting work done—namely a force of willing, skilled and intelligent workers, men who average higher in all of these qualities than at any other time within the present century.

Many influences have brought this about, chief among which is the decline in employment. In so far as section labor is concerned, it has resulted from the decline in agricultural employment, followed during the last two years by the movement from the industrial centers back to the small town and the farm by reason of urban unemployment. Section foremen in settled country have had no trouble in manning their gangs with men who belong to the communities along the line and, furthermore, this condition has prevailed long enough so that most section men are skilled trackmen of several years' experience.

A similar condition prevails in extra-gang work. Except for a part of the Mexicans, where men of that nationality are employed, practically all men recruited for extra gangs speak and understand English. Moreover, whether it is the negro in the south or the hobo in the north and east, who is shipped out, the chances are more than even that he is a trackman of experience, who has worked not one year but many in ballast and rail gangs—in fact often under the same foreman.

Another factor not to be overlooked is the accumulating experience of trackmen far and wide with labor-saving tools. Trackmen today are not only proud of their skill with a spike maul, but many possess a thorough familiarity with such equipment as the tamper, the spike driver and other tools. Thanks to this knowledge, power tools are no longer being "introduced"; they are being put to work. So, while the roadmaster and the foreman have much to worry them in these trying times, it is a source of great satisfaction that the men with whom they work are willing and skilled. No longer are they concerned with imported section gangs, an alarming labor turnover, or—to hark back to pre-war days—the interpreter and the padrone.

RAIL LAYING

Continued Progress is Being Made

IN A paper presented before the New England Railway Club in Boston last spring, George J. Ray, chief engineer of the Lackawanna, spoke at length with regard to the physical improvements and economies which have been effected in railroad operation and maintenance in recent years, and frankly revealed some of the achievements of engineering and maintenance men which, unfortunately, in far too many cases, have been overlooked entirely or relegated to the background of the picture of railway progress. Among the many subjects which he discussed was that of laying rail and the large advances and economies which have been made in this phase of maintenance work through the use of up-to-date equipment and highly organized mass production methods. Directly to the point in this regard, W. J. Backes, chief engineer of the Boston & Maine, called attention to the rail laying work then in progress on his road which

showed marked savings over similar work in past years. He pointed out that as recently as 10 or 12 years ago it had cost as high as $4.50 to $5 a ton to lay rail, using from 300 to 400 men, whereas the laying of rail this year cost less than $2 a ton, with a full complement of power equipment and only about 150 men.

The increased efficiency and economy of the methods now being used on the B. & M. were fully evident in the comparison drawn, but that the contrast could have been made even more striking is clear from the article which appeared in the September issue, entitled, "Machines Speed Rail Laying on the Boston & Maine," which described in detail the work and the results which were actually accomplished in the rail laying to which Mr. Backes referred. In this work, which extended over 12 days, an average of 156 men, including 21 cooks, timekeepers, waterboys and other miscellaneous employees not actually engaged in rail laying operations, stripped the track of 100-lb. material, adzed all ties, laid new 130-lb. rail and fastenings, and dismantled the old rails at the average rate of 583 39-ft. rail lengths a day, and at an average cost of $1.77 a ton, including charges for all equipment used. On the day of best performance, 734 rails were laid on the same basis, at the rate of one rail in approximately every 44 seconds of working time, and at a cost of only $1.58 a ton. Five thousand two hundred and thirty-seven tons of rails were laid in the work. At a cost of $4.50 a ton, the total expenditures would have amounted to in excess of $23,500, whereas the total actual cost of doing the work this year was approximately $9,250, a saving of approximately $14,250, and in reality, on a relatively small amount of work.

Such remarkable improvements in methods and reductions in the cost of doing one of the major items of track maintenance work are a tribute to the administrative ability and ingenuity of present-day engineering and maintenance officers, and are indicative of the economies which these officers and their men have contributed toward the remarkable record of efficiency and economy which the railways have made in recent years.

PROGRESS

Manufacturers Aid in Making Advances Possible

PROGRESS is a relative term. In some cases it must be measured in small units; in others the forward step is of considerable magnitude. Lack of real progress is not always the result of the innate tendency, so often observed, to follow beaten paths, but may arise from lack of means to make a much desired advance. At times, it is true that advances are made suddenly with no apparent preliminary preparation. In such cases, however, investigation will generally disclose that the forward movement did not just happen, but that arduous effort and many failures preceded the time when conditions made the improvement possible.

Fighting snow in railway terminals is a case in point. Keeping the main tracks open is the important objective out on the line, and for many years effective equipment has been available to do this. While the actual accomplishment of this objective is not always a simple matter, the point is that satisfactory devices for clearing the main tracks have been in use for more than 50 years. This equipment is of little or no use in terminals, where the problem is largely that of keeping the switches clear of snow during the period of the storm and of disposing of accumulations of snow after it has passed.

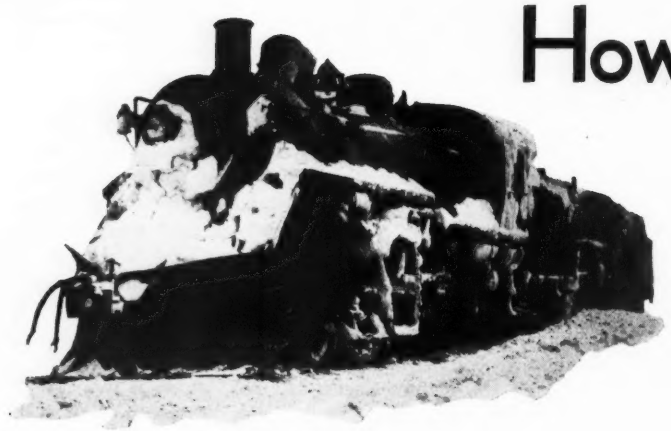
Progress in the methods of fighting snow in terminals had apparently been at a standstill for many years. Every year maintenance officers checked their requirements for snow brooms and shovels. They held meetings with their supervisory forces to insure that they were informed as to their duties and were impressed with the vital importance of taking measures to avoid injury to the men comprising the gangs. Arrangements were perfected for feeding casual laborers which it was always necessary to put into the field. When the storm arrived, there was often uncertainty as to the number of extra men that would be needed, so that in some cases too many men were sent out, in others, not enough. In any event, the regular forces were frequently far behind the requirements of the situation by the time this help arrived. Under these conditions, trains were likely to be delayed, traffic moved slowly or not at all and derailments were not unusual.

This situation changed almost overnight. During the two severe blizzards that struck Chicago two years ago, several distinct types of snow-melting equipment were in service at one of the principal passenger terminals in the city. While this equipment was on trial, the installations were not altogether in the nature of an experiment, since each of the devices used had already demonstrated its usefulness elsewhere under similar conditions of snow and wind. The performance of the several devices was so satisfactory (this being the only terminal in the city that had a clear record with respect to delayed traffic) and the economy of their use was so notable, that several other roads made similar installations during the following summer. The record of the performance of these installations during one of the worst blizzards that ever struck the city is given elsewhere in this issue.

It was a spectacular advance in the art of fighting snow that is described in the article alluded to. But back of this event lies a long record of patient endeavor and disappointing failure in the search for a better method that would be both dependable and effective. Plans that looked promising did not meet the requirements of service. Heat was dissipated by the wind; pipes filled with water, blocking the flow of oil, gas or steam, and froze; inflammable liquids caught fire or generated gases and exploded; electric devices short circuited or burned out. But through patience and dogged determination, a variety of devices were ready to demonstrate their value when the opportunity came. They met the requirements of a difficult situation and enter the record as a sudden and spectacular discovery.

Few of us have the opportunity to look behind the scenes and see the slow and laborious path that must be traveled to accomplish any form of progress. Those who are permitted to do so in the industrial field have a keen appreciation of the constant effort that is being made by the manufacturers of railway supplies and equipment to devise new or improve old tools with which the maintenance forces accomplish their tasks. What has been described in the field of snow fighting has its parallel in practically every other line of maintenance work.

How the Boston & to Fight



Double-Header With a Single-Track Plow Attachment After Some Heavy Line Work

Modern equipment in the hands of highly trained forces and operated according to carefully prepared programs gives this railroad the upper hand

BACKED by months of preparation, with detailed division and system snow-handling programs, a highly organized force of employees trained and primed for snow duty on a moment's notice, and a full complement of snow-fighting equipment and devices ready to go into action almost automatically, the Boston & Maine views the approach of winter with a feeling of security.

Fortunately, from the standpoint of the railroad, Massachusetts and certain other parts of New England have not had what the railroad would call a serious snow storm for the last few years, but there are many on the road who remember the winters of 1920 and 1926, when successive storms piled an average or two to three feet of snow over the landscape in a few days. When such storms will return no one knows, so the Boston & Maine recognizes that it must be prepared. Unprepared, its 2,100 miles of lines could be tied up for days, disrupting train operation, disorganizing service, causing delays and inconvenience to passengers and raising havoc with the regular daily delivery of milk and foodstuffs upon which the communities and cities on its lines depend. While such conditions would be felt generally over the road, no part would be affected more seriously than the Boston terminal area, with its extensive and intensively used freight and passenger facilities. Here, in addition to hundreds of through passenger and freight movements daily, there are thousands of yard movements and more than 1,100 scheduled and unscheduled train and engine movements into and out of North station, Boston, every 24 hours.

Until recent years the railroad has depended largely upon hurriedly marshalled man-power to keep its lines open during snow storms, particularly in and about terminals. While man-power is still indispensable to a large extent in severe storms, the main reliance of the road is now placed in modern snow-fighting equipment and snow-melting devices, effectively controlled and operated by well trained and organized regular employees.

As will be understood readily by railway maintenance men, the detailed preparations made to meet winter storms on the Boston & Maine are not the result of last minute thought and effort. On the contrary, the first preliminary steps are taken in the late summer, when the engineer maintenance of way of the road sends out letters to his division engineers, instructing them to look to the repair and conditioning of all snow-fighting equipment and to the formulation of their individual snow fighting programs. Then begins the check-up of equipment and the drawing of definite plans for the fall and winter. The supervisors meet with the division engineers and then later with their foremen to discuss preparations for winter and actual snow-handling methods. The division engineers make and check arrangements with the operating and mechanical departments for the assignment of locomotives and crews for snow-fighting service, and for the added man-power support to be rendered by these departments in cases of emergency. The supervisor of work equipment and his force check the condition of all mechanical units of equipment other than locomotives, to insure their serviceability by early November. Brooms, shovels, sand, salt, calcium chloride, snow-melting oils and other such supplies are checked up and replenished where necessary, and everything of this nature is stored in an orderly manner at assigned points where it will be available for immediate use.

Preparing the Track

While these various activities are gathering impetus as the winter months approach, the track forces give special attention to the matter of drainage, especially about switches, interlockings and water tanks. This work also includes the inspection and cleaning of ditches, culverts and drains to insure proper run-off.

By the first of November, advance preparatory measures are out of the way, the equipment is ready for prompt operation, and the division programs of equipment assignment and force organization are fully completed and in the hands of all concerned. By this same time the individual programs of the different divisions have been checked and co-ordinated in the main office of the road, under the direction of the engineer maintenance of way, and the entire force of the enginering department at the road's headquarters has been organized to handle the snow fighting problem from a system standpoint.

Much of this preparatory work is simplified by the efforts of previous years, during which many details of organization were worked out and adopted. As far as the detailed program of organization of men and equipment on each division is concerned, therefore, it is mainly a matter of checking over the program of the previous year and revising it in accordance with any changed conditions or as a result of any weaknesses which may have become evident.

One of the interesting phases of the manner in which the Boston & Maine is prepared to meet winter storms is the large amount of special snow fighting equipment which it maintains for the sole purpose of being able to

Maine Organizes Snow Storms

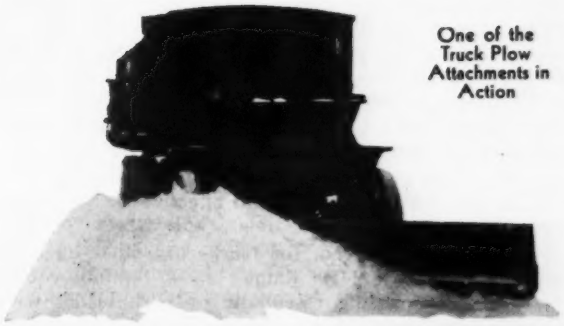
render "on time" service to its patrons, regardless of weather conditions. On the road as a whole, this equipment includes 31 double-track plows, 27 single-track plows, 81 steam snow melting and blowing attachments for engines, 7 tractor sweepers, 5 snow loading machines, 18 plow attachments for highway trucks, 29 pilot plows, 5 Jordan spreaders, a mechanical platform sander, a large number of switch heater installations of the oil-burning and gas-burning types, and about 125 hydrocarbon snow melting stations. This equipment is distributed over the railroad in accordance with the known needs of the different divisions, and in such manner as will permit its most effective use during storms.

While the assignment and use of the equipment on each of the different divisions is of interest, the greatest interest lies in the equipment maintained on the Boston Terminal division with its heavy through and commuter traffic, which makes it essential that the tracks of this division be kept open regardless of conditions elsewhere on the line. In this territory, plows and spreaders are essential for keeping the through and yard tracks open, but one of the main problems is to keep the switches in operating condition, and to keep the large areas of service tracks and platforms in the neighborhood of North station open for the use of shippers and the public. The method of handling snow in the yards with pusher plows and spreaders has become well established, and, when storms occur there is little difficulty in keeping open enough tracks to handle the traffic and in readily freeing the remainder of the tracks which may have to be given up temporarily. Keeping the switches open causes a somewhat more difficult problem, and yet, this has been solved largely by the installation of switch heaters, oil snow melting stations and steam blowers on yard engines, which have done away with the army of men which was necessary for this purpose heretofore.

Large Snow Loaders Effective

One of the most difficult problems in handling snow on the Terminal division has been to keep open the area immediately around North station, where the congestion of tracks, roadways and buildings makes it necessary to load and move practically all of the snow that falls. Until the last two or three years, all of this work was done by men with brooms and shovels, a method which was not only expensive, but which was slow and inadequate. Recognizing this, the road purchased a considerable number of special machines to handle this work, these machines including a number of plow attachments for motor trucks for use in clearing roadways, tractor sweepers for cleaning off sidewalks and passenger and freight platforms, two Barber-Greene tractor-mounted snow loaders for picking up and loading piled snow, and a Fox power snow loader, mounted on flanged wheels, for picking up and loading snow plowed or otherwise piled on tracks.

This latter unit of equipment, which was provided with its car wheel mounting by the railroad, is used to clear the long exposed passenger tracks at North station.



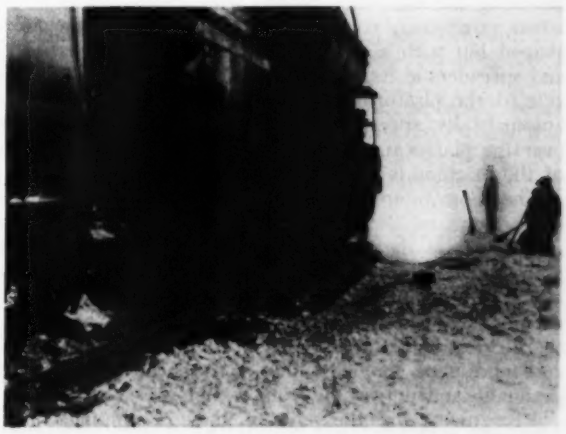
One of the Truck Plow Attachments in Action

In removing snow from the platforms and tracks at the station, the tractor sweepers are used on the platforms, throwing the snow on to the pairs of tracks between platforms. When the snow becomes sufficiently deep on the tracks, a train of empty hopper or dump cars is pushed in on one of the tracks, while the snow loader, operating down the adjacent track, loads the snow directly into the standing cars.

In addition to its use for loading piled snow, the equipment can also be used effectively in picking up the snow that falls on the wide expanse of tracks about the station, or which is plowed into deep piles on certain tracks in yards. This will prove of particular value in the station area in the future, in the case of storms, since practically all of the trestlework which has supported the track approach to the station has now been filled in, and it is, therefore, no longer possible to dispose of the snow through the trestlework, as was done so conveniently in the past.

The Barber-Greene units on the Boston & Maine are self-loading, belt-conveyor machines on tractor mountings, which can load either directly into dump trucks placed behind them or into cars on adjacent tracks. These units, which are capable of doing the work of more than 100 men and of operating with greater efficiency with the increased amount of snow to be handled, are used for loading snow which has been plowed or swept from platforms and driveways. With their tractor mountings, however, they can be used effectively out in the yards or at other points at the terminal, operating directly over or between the tracks, if the necessity for such use should arise.

In order to insure a constant and convenient supply of gasoline and oil during storms for the snow loaders and other gasoline-operated units on the road, blanket orders



Eighty-One Engines on the Road are Equipped With Steam Snow Melting and Blowing Attachments

for these supplies are usually placed at several gasoline filling stations convenient to the work of the different units. Under this arrangement, the operators secure requisitions for the gas and oil needed from the snow headquarters to which they report, which are honored and receipted at the stations sharing the blanket order for supplies.

Many Smaller Units Effective

The plow attachments for trucks are other effective units of the Boston & Maine's snow fighting equipment, these consisting essentially of push blades with suitable attachments for ready application to standard four or five-ton dump trucks. At Boston, without the necessary trucks in its own equipment for the operation of these plows, the road has entered into a contract with a local trucking concern to furnish on demand all of the trucks which it may require during any storm to put its plows in operation.

Keeping switches open, particularly on the Terminal division, has been effected largely in recent years by Greer oil burners, using Maloney oil. In these installations as many as 15 to 20 switches are equipped with burners in some cases and are fed from supply tanks of 1000 gal. or 2000 gal. capacity. Last winter, gas and electric heaters were tried out in a limited way and proved particularly effective at points where the smoke and open flame of the oil burners were objectionable. This year, with the complete rearrangement of the track facilities leading to and entering the station, the road has equipped 92 simple switches and 18 slip switches with Vaughan gas switch heaters, in a system which will be expanded later undoubtedly to include all of the more important switches.

With butterfly type sheds over its station platforms, a necessary item of work, but one which had been done in a rather unsatisfactory manner, is the application of sand to the platforms to keep them from becoming slippery. This work had been done in the past by men carrying pails of sand, who threw the sand about over the slippery areas.

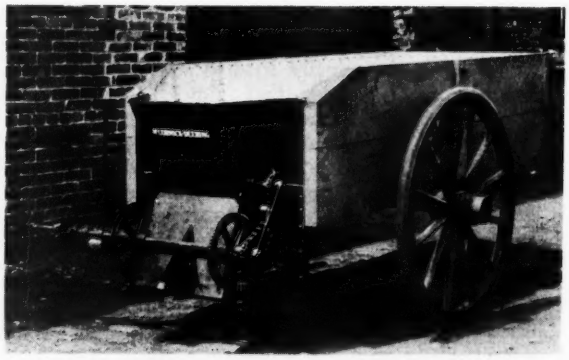
Use Machine to Spread Sand

To enable this work to be carried out in a more effective and economical manner this year, the road has adapted a McCormick-Deering lime spreader to the sanding work. This piece of equipment, which was provided with rubber-tired wagon wheels by the railroad, replacing the steel-tired wheels with which it was fitted when purchased, consists essentially of a large box-shaped bin with a dual installation of automatic feeds and spreaders at its rear end. Pulled by one man up one side of the platform and down the other, this machine automatically spreads the sand in a uniform manner over the platform. The area of spread in a single pass of the machine is approximately ten feet.

The most interesting feature in connection with the snow plows on the road, which, in general, are of the usual type, is the special, electrically-heated windshield glass which was installed in one of the plows in a test last winter, to overcome the disadvantages of ordinary glass in becoming covered with sleet and snow and, therefore, totally ineffective. This glass has a grid of resistance wires molded within it, so that it can be heated gradually and uniformly from within itself.

Recognizing that the value of its snow fighting equipment lies in having it in perfect operating condition, ready to go into immediate service, the closest of attention is given to the care and repair of the equipment. In the spring, all of the different units are tied up at specific points on the system so that they will not be lost sight of, and all of the power units, such as the snow loaders and tractor sweepers, are housed under cover.

Early in the fall the supervisor of work equipment starts his mechanics over the system to check up on the condition of all units of snow fighting equipment. During this inspection, all plows requiring heavy repairs are scheduled to one or the other of the car shops on the road, while all other equipment, including those plows requiring only minor repairs, are put in shape, and painted when necessary, ready for winter use. All of the switch heater oil piping systems are checked up and put in condition by the plumbing gangs of the bridge and building department.



The Lime Spreader as Adapted for Spreading Sand on Platforms—Revolving Spreader Discs Are Not Shown

All Employees Subject to Snow Duty

The snow-fighting organization on the Boston & Maine is built around a fully understood order that practically every employee on the road, regardless of department, is subject to call for snow duty of some character. On the Terminal division, for example, the order is written as follows, and forms the preface to the division's snow handling program:

1—During the time that a snow storm is in progress on this division, and also after a storm, as may be necessary, it is the duty of every employee on the rolls of the division to assist in snow handling work.

2—For storms commencing during regular working hours, all employees will be considered as automatically on duty, and will not go off duty until released by orders from the proper supervisory officer in control of the territory to which they are assigned.

3—For storms commencing outside of regular working hours, that is, nights, Sundays and holidays, responsibility rests with every employee to be at his proper place of duty in time to keep ahead of the storm properly.

The track forces on the road are organized to bear the brunt of the snow handling work, and the supervisory officers of these forces are in charge of most snow handling operations. This, however, in no way relieves the employees of other departments from their share of responsibility. In fact, the specific parts to be played by the personnel of the other departments is usually stated definitely in the different division programs. For example, all crews for the operation of snow plows are assigned in advance; the mechanical department is given the responsibility of keeping turntables in operating con-

dition, and of removing snow from many of the tracks immediately about enginehouses, or to assist in this work when the track forces are overtaxed; signal department employees are, in many cases, assigned to snow removal work at interlocking stations; and bridge and building department employees, including machinists, carpenters, masons, painters, tinsmiths, plumbers and derrick and crane engineers and firemen are all given definite assignments in the snow-handling programs.

Ordinarily, the bridge and building department forces are charged principally with the clearing of passenger and freight house platforms, sidewalks and driveways, and of operating all machines used in this work. Snow removal from the platforms and sidewalks at North station, at points inaccessible to the sweepers, is a good example of a bridge and building department assignment. This work, which is provided for in an order in the snow handling program of the Terminal division, is assigned to a crew made up entirely of bridge and building department men, working under the supervision of the division supervisor and assistant supervisor of bridges and buildings. In the 1930-31 program, this crew consisted of 6 masons, 6 carpenters, 5 painters, 15 tinsmiths and tinsmiths' helpers, 25 plumbers and plumbers' helpers and several crane and derrick operators. The operation of the three snow loaders used by this force was assigned specifically to bridge and building department men, as were also all dumping and trimming operations in connection with the unloading of the dump trucks loaded by the loaders.

Terminal Forces are Fully Organized

Just how the different divisions organize for snow fighting service is well illustrated in the typed snow handling program prepared on the Terminal division. This program, which contains all matters pertaining to the snow handling problem on the division, including the division of territory, equipment, the assignment of forces, and special instructions, is furnished to all concerned in bound mimeographed sheets. The program for last winter contained 29 sheets, and each separate matter dealt with therein was designated as an order. Order 1 dealt with the obligation of employees in times of snow storms, as has already been mentioned.

Order 1A outlined specifically the manner in which section foremen must report snow conditions on their territories to the headquarters of the division. Order 2 outlined the organization of District No. 1 of the division into specific zones, to take effect during storms, together with the names of those in charge and their headquarters. Order 3 dealt specifically with the tractor sweepers, their location, scope of operation, operators, service men, etc. The following, under the head of "Tractors," is quoted from this order:

"Snow sweepers will be kept at the North Terminal garage, Boston, (Richmond 4789). These machines are intended to be used primarily on the platforms at North station and must be put in service promptly at the beginning of a storm.

"During regular working hours, operators will put these machines in service automatically. Outside of regular working hours, operators will report to the division snow headquarters automatically for duty on these machines, and snow headquarters will be responsible for getting the machines started."

Order No. 4 covered all important features in connection with the operation of the truck plow attachments, including the method of ordering trucks from the trucking company for the operation of the plows, the location of the plows themselves, the specific points at which the plows were to be operated, the supervision to be maintained over the plows, a complete list of plow operators, and the names of approximately 30 other men, designated "call men," who could be impressed into service if requirements should demand. Order 5 gave all information and directions for the operation of the three snow loaders on the division, and included the names and addresses of the assigned operators and crews assigned to these units. Order 6 dealt with the assignment of bridge and building forces for keeping clean the platforms and sidewalks about North station, as referred to previously in this article. Orders 7, 8 and 9 outlined the territory covered in Zone 1 of district No. 1, and gave the names of the supervisory officers and men responsible for the specific items of work in this zone. It is interesting to note in this order, that definite assignments were made to a large number of carpenters, several welders, and a transitman.

Duties of Other Employees

Orders 10 to 15, inclusive, gave detailed information concerning the work and assignments in Zones b, c and d of District 1, and here again are seen the names of engineering department employees, and a large number of bridge and building department men, including carpenters, roofers, bridge inspectors, blacksmiths, etc., assigned to snow removal work in yards and at interlocking stations. Orders 16 to 18, inclusive, gave complete details with regard to the snow-handling work and forces for Districts 2, 3 and 4, and, as in the case of the orders covering the zones of District 1, listed each point on the district requiring special attention, together with the specific force responsible for the snow handling work at each point.

Loading Snow at the Boston Terminal With a Barber-Greene Power Snow Loader

Order 19 dealt with the duties and the assignments of the signal forces, listing the points for which this department was held responsible and the names of the men assigned to each point, while the remaining orders, through No. 23, listed the locations of hydro-carbon stations and switch heaters, the location and engine numbers of the engines equipped with snow melting devices, and the points at which certain of the larger commercial units of snow fighting equipment could receive emergency repair service.

Supplementing this part of the program, the Terminal division also issues a separate snow plow schedule in mimeograph form, which lists the number of each plow, its type and headquarters, the addresses and telephone numbers of its operators and the exact territory over which it is to be operated. This schedule also lists all

ORDER NO. 2

TERMINAL DIVISION

SNOW HANDLING PROGRAM

General Organization District #1

1. In general, all forces and machinery used on the tracks will automatically come under the control of the Track Supervisor and his Assistants and all forces and machinery used on platforms, sidewalks, streets and driveways will come under the control of the Supervisor B&B and his Assistants.

2. Tracks will be supervised so as to divide same as soon as possible after a storm starts, into 4 Zones as follows:

Zone "A" - Sections 1 - 2 - 7 - J. F. Talbot
J. Healy at Snow Headquarters

Zone "B" - Sections 3 - 4 - B. J. Casey
C. Kenney, Sec.3 -M.Quigley,Sec.4

Zone "C" - Sections 5 - 6 - B. J. Casey

ORDER #19

TERMINAL DIVISION

SNOW HANDLING PROGRAM

SIGNAL FORCES:-

	Telephone
Supervision:-Leod MacLeod, Sig. Supvr. (Sig. Maint. Bldg. Draw #1)	302
Albert Pennington, Asst. Supvr. Tower "C" and "D"	123-2--124-1
Thomas Richardson, Gen. Fore. Hump Yard	208-657
T. O. Ellis Tower "B" & "H"	344

Assignments	Station
J. Cassidy	Tower "B"
E. Irish & J. Jacques	Tower "C"
R. W. Ellis	Tower "H"
J. Marcy & J. Cappelluzzo	Winter Hill Interlocking
G. Mader & H. Woodward	Everett Junction

ORDER #12

TERMINAL DIVISION

SNOW HANDLING PROGRAM

ZONE "C" - Section No.5

Track	- Supervision - B.J.Casey, Asst.Track Supvr. D. Hurley, Draftsman P. Finnegan, Section Foreman
Interlocking Tower "C" and Lower End Yd.9	- Asst. Foreman and 4 men, Asst. Foreman and 5 men
Lower End Yd.10	- Foreman Carpenter Perham and 6 Carpenters
North End Yd. 2 and Hotel Route	- Foreman Roofer Johnston and 3 men
South End Yd. 2	- Bridge Insp. Rafuse and 3 men from Fore. Roofer Johnston Crew.

ORDER NO. 4
Sheet 1

TERMINAL DIVISION

SNOW HANDLING PROGRAM

Snow Plows for Driveways

1. Dump trucks equipped with plows will be furnished by Consolidated Trucking Company. Ordering of trucks and pilots will be handled by Snow Headquarters - Ex. 574-670.

Plows

2. Call Consolidated Trucking Company Garage - Porter 5310, or C.T.Co., Manager, Mr. Lewis, Stadium 7902.

Destination

3. 1st Truck with Plow to Haverhill St. and Yard 12 Driveways.
2nd Truck with Plow to Freight House "A",
3rd " " " " Rutherford Avenue,
4th " " " " Water St. Bulk Yard,
5th " " " " Milk Yard,
6th " " " " Mystic Wharf,
7th " " " " Freight House "A",
8th " " " " Rutherford Ave.

SNOW PLOW SCHEDULE - TERMINAL DIVISION - SEASON, 1930-31.

Plow No.	Kind	Headquarters	Addresses of Plow Operators	Phone Number	Territory
W3663	Double Trk.	Boston, Mass.	Dana Burroughs 49 Avon St., Wakefield, Mass.	Crystal 0662-W	Portland Main Line Western to Wilmington Jct. Medford Branch-Wakefield Jct. to Danvers.
			Ben DeMatteo, Relief 12 Sanborn St., Reading, Mass.	Reading 0954-W	
			(Week days in Boarding Car at Medford Jct.)		
W3646	Double Trk.	Salem, Mass.	Richard Welch, 9 Dunlap Street, Salem, Mass.	Salem 4529-W	Portland Main Line Eastern Beverly - Boston-Saugus Br.

Typical Pages From the Snow Handling Program of the Terminal Division

points of restricted clearance on the division, so that the operators and train crews do not have to rely upon memory or sight to avoid damaging the equipment, and possibly delaying the snow-removal work.

With such detailed programs on the different divisions, covering every phase of snow fighting, and with the main office organized to co-ordinate the efforts on the divisions and to authorize additional help when needed, the Boston & Maine has an unusually effective snow fighting organization, which mobilizes automatically and continues in force until a storm has abated and the tracks are open.

Frequent Reports Required During Storms

In spite of this preparedness to meet severe snow storms under almost any condition, the road takes advantage of every means available to prevent a storm breaking over it without advance warning. In this regard, it studies the daily weather reports carefully and communicates with the weather bureau for more detailed or more frequent reports when necessary. Furthermore, the different divisions are required to report promptly to the main office the beginning of a storm and all details concerning it, including its direction of movement and its probable severity. This information is then relayed to those parts of the system which are most likely to be affected by the storm later on.

During storms, night or day and Sundays and holidays alike, the wires are kept busy with periodic reports concerning the storms themselves, the amount of fall, operating conditions and the manner in which the different units of the snow fighting organization are functioning. Designated section foremen are required to report by phone to the division snow headquarters every two hours during storms. Signal, bridge and building and mechanical forces are also required to make periodic report, so that at all times the division officers know the exact status of conditions on their territories. In turn, the division officers are required to make detailed periodic reports by wire or telephone to the office of the engineer maintenance of way at Boston, so that any break-

(Continued on page 985)

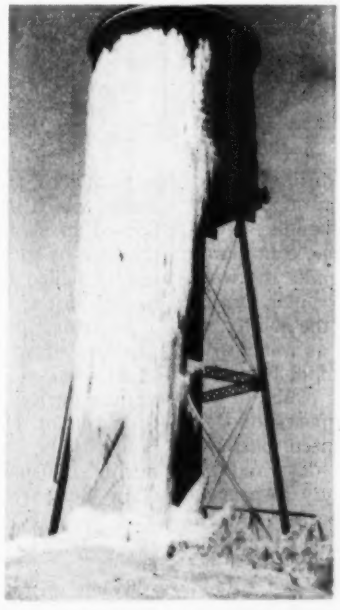
Keeping "Jack Frost" Out

What the water service man is up against and what can be done to help him

By E. M. GRIME
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

IT HAS been said that "the telegraph is the eyes and ears of the railroads," and if this be true, then water is the life stream of the transportation machine wherever steam power is used. To the layman, water is so nearly free that he scarcely gives it a thought until the well runs dry, but during the winter months in the northern areas there is no facility on the railroad of greater importance or more necessary for effective operation than locomotive water supply.

Among the improvements in operating methods that have been carried out in the past few years, two of the most important are the speeding up of both passenger and freight service and the lengthening of engine runs. These changes have tended to eliminate many of the intermediate water stations which were necessary under former conditions, and at the same time have greatly increased the importance, from the standpoint of water supply, of such key points as those where the coal supply is located or where stops may be required for other reasons. A water failure at one of these points may compel one or more additional stops elsewhere, thus developing a serious handicap for trains which already have no minutes to spare on their regular schedules.



Confronted with these operating requirements, as cold weather approaches, it becomes one of the most imperative duties of the officer who has charge of water facilities to make certain that every detail that may affect operations is being satisfactorily provided for. Bridges may possess an adequate factor of safety against all contingencies except fire, not much can happen to the buildings, but with the water supply it is different. Duplicate pumping equipment, repair parts in stock, and emergency stations help; but the safety factor of a water station is small and the fact remains that failure for any reason, especially at a critical time such as during a severe storm, has been known to tie up several important trains and cause operating difficulties over an entire division. The railroad is beset with keen competition from every direction and one of its best bids for business is the reliability and speed of the service which it can furnish. For this reason train delays, even under adverse conditions, are not to be tolerated, and the operating officer who would avoid sleepless nights of worry and trouble will spare no efforts to place the water facilities in as nearly perfect condition as possible before cold weather approaches.

Among the many details of the ordinary water station which usually require at least some special attention in advance of freezing weather, the storage tank is quite important. The wooden tub on a timber or a steel substructure still predominates, and its weak point, so far as frost protection is concerned, is the insulation of the riser pipes. The housing or husk surrounding these pipes, usually consisting of matched and dressed boards and tarred felt paper forming three or more dead-air spaces, must be kept in good repair, especially around the base where the cold will penetrate most readily. If the boarding is getting old and somewhat decayed, a double layer of tarred felt paper nailed around the outside, with the lower edge buried in the soil, may make it possible to postpone more costly repairs. Care should also be given to the connection under the floor of the tank, and repairs made if settlement or some other defect has left an opening. During extremely cold weather, especially at points where only a limited quantity of water is taken and therefore little agitation takes place in the riser piper, it is often desirable to install either a kerosene car heater or a large barn lantern in the bottom of the frost chamber. Experience has shown that where the husk is new and tight, there is not always sufficient air circulation to provide the oxygen required to support the flame of a car heater during a twenty-four hour period, and in this case the barn lantern provides sufficient heat and proves satisfactory in keeping out the frost. These heaters may only be necessary during the extremely cold weather, but in any case the task of keeping up the oil supply, trimming the wick, etc., should be assigned to the pumper, the section foreman or some other regular employee. Where stoves are used, sheet iron protection on the adjacent wooden walls should be maintained to reduce fire risk to the minimum. Concrete tanks are often housed in around the base to form a convenient place for pumping machinery, and the heat retained from regular operation is sufficient for frost protection.

Protection for Steel Tanks

Steel tanks are likely to freeze in the leg unless they are located at important stations where there is almost constant movement of the water. A ⅜-in. steel plate offers little insulation against a twenty-mile gale and a temperature hovering between 20 and 40 deg. F. below zero, and without insulation water has been known to freeze practically solid in the water leg of such a tank. Fortunately, such freezing has apparently done no damage, but it gives rise to the expense of using a large

freight engine for 24 hr. to thaw it out. At many points it is, therefore, necessary to insulate these steel water legs by three dead-air spaces built up in the same manner as for wooden tanks. Under continued cold weather, the ice on the sides of a tank will become 24 to 36 inches thick, and when this has formed, the remaining water space is fairly well insulated. Where the tank has a wayside spout, the chain or rod operating the valve must be kept free of the ice which may form on the water surface and, clinging to the rod, prevent the opening of the valve.

One of the most important details of water-tank maintenance, where water is served by means of a tank spout, is to be certain that the tank valve seat is in good order so as to avoid drip leakage and consequent gradual filling up of the outlet pipe with ice. Even under the best of conditions, this will frequently occur due to a small chip of wood or other particle lodging on the valve rim and preventing the disc from becoming properly seated. For this reason it is well to have a length of steam hose available, either on the tender of the coal freight engine or at the water station, for connection to the locomotive boiler to thaw out the tank outlet pipe and spout whenever ice accumulates. Where water is taken from a deep well with a temperature ordinarily about 60 deg. F., there is much less trouble with ice formation in the tank than when it is secured from a flowing stream where the temperature will usually hover around 32 deg. for several months of the winter.

Effects of Economy Measures

The drastic economy measures which every railroad management has been forced to carry out during the existing depression have resulted in the laying off of many pumpers and requiring other pumpers to handle several water stations or, where this is impracticable, contracting the pumping to some outsider who can handle the work at odd times not conforming to the usual regular tour of duty. While it will be necessary during the winter, to modify this practice at certain places such as water softening points where it is necessary to maintain heat continuously, it may be possible to keep other plants in satisfactory operation by more intensive supervision. At some points where, by reason of decreased business, water would be taken regularly once a day, and the water is, therefore, not disturbed sufficiently to prevent freezing, it may be advisable for the superintendent to post a bulletin requiring the local freight or certain unimportant passenger trains to stop regularly for water whether they actually need it or not.

As a rule, water tanks are no longer located or equipped for delivering direct to tenders on adjacent tracks, and at least on main-lines water columns are in almost universal service. If of modern design, the water column is highly efficient, but its valves and other working parts cannot always be located below the frost line. Even with reasonably deep pits, a frost deck below the regular deck, maintained in tight condition, is usually desirable to provide at least one dead air space. In certain cold locations two frost decks work out advantageously, and additional protection is frequently provided by banking over the top of the platform with cinders. This may be objectionable by reason of reduced clearances along the main tracks.

In some cases it may become necessary to maintain a lantern or car heater in the water column pit, but it is difficult to keep a flame going under this condition and the addition of another air space where headroom permits is usually more satisfactory. Where a column pit is located on the side of an embankment, it is desirable to grade out around it to a distance of six or eight feet for safe frost protection. Before cold weather, each water column should be gone over to make certain that the packing is in good shape and that the valve is free from any slight incrustation which might cause it to stick in a partially closed position. All drainage openings in the column should be clean and the sewer drain from the pit must be in working order so it will carry away the waste water quickly. A coating of grease on some of the working parts may help considerably, not only to prevent corrosion but also to aid in more smooth operation.

Heating Stoves

This winter, when working hours will be shorter in many cases than heretofore, the heating stove will receive attention at less frequent intervals; consequently pump houses will require closer inspection to insure the adequate maintenance of such details as storm windows and doors. Larger heating stoves may be found desireable, as well as a better grade of coal than may have been in common use heretofore. Wherever practicable, provision should be made for pet cocks to drain pockets at the pumps in the pipe lines, gage lines, or other places likely to freeze. Detailed instructions to the pumpers covering these matters of the drainage of equipment are desirable, especially to cover the stations of lesser importance where the pumping equipment may be in service for only a short period of the day and where stove heat is depended upon to prevent freezing.

At water-softening plants one of the important details is the sewer for the disposal of sludge. The ground area at the outlet of the sludge line should be cleaned out so as to allow a free flow and preclude the accumulation of sludge which may block the opening. Settling tanks not housed in should be made as tight as possible around the base by means of a double layer of tarred felt paper tightly nailed to the tank and with the lower edge imbedded in the soil to cut off air circulation. Special care at softening plants is necessary to be sure that heating facilities of whatever nature will function satisfactorily at all times to guard against freezing of pumps, proportioning devices, gage lines, or small piping. The operator's tour of duty should be spread out to cover as many hours of the day as practicable under the schedules and, during unusually cold spells, it may be advisable to allow him extra time to come back and fire up.

Passenger Coach Supplies

While an uninterrupted locomotive supply is the first consideration, the places where passenger cars must be filled also requires careful attention during the extremely cold weather. Where old style hydrants are in use, the hydrant boxes may well be provided with a substantial frost decking at least two feet below the platform level. The space thus provided should contain the valve operating lever with proper stops so that the valve can readily be kicked open or closed without damage. It is important to inspect all such places to be sure that the vent for the drainage of the riser is open and also that the sewer drain is functioning properly. If the valves are of the type which may be either fully opened or fully closed simply by raising or lowering a lever located in a small cast iron box flush with the station platform, there will be very little probability of any trouble unless water wasted in the valve box is allowed to form sufficient ice to prevent the proper seating of the lever. All hose used for watering the coaches should be drained after being used and preferably stored in a heated building until required for the next train.

Although a regular force is provided to maintain the various water service features in proper condition, successful operation during the trying period of extremely cold winter weather requires the co-operation of all concerned. Firemen should be trained to handle tank valves and water columns with reasonable care, to open and close the valves without unnecessary jerking, to push water column spouts back carefully into normal position and to see that the locking devices properly engage, to take care not to flood the tender or to remove the spout before the valve has been closed off. A little timely discipline for some carelessness at the start of cold weather may have an excellent effect on all those in the engine service who have the good fortune to hold jobs at this time. I recall a point where water columns are located in the platform of an important station. The ice that accumulated each winter around these columns created a dangerous condition. After making certain that this was not the result of leakage, the superintendent corrected the condition by serving notice that the next man who found it necessary to waste water at this point would be suspended. Since then the platform has been as free of ice as if no column were there.

The Water Service Foreman

The proper time to overhaul the water facilities is in the summer when the work can be handled at minimum expense. It has been shown that during the most difficult operating period of the year the water supply is the most important facility or at least the one likely to create the most serious trouble in case of failure. On most railroads this branch of the work is under the charge of the supervisor or master carpenter, and in turn under the immediate direction of one of his most necessary subordinates, the water-service foreman. This man should possess the qualities of good horse sense, resourcefulness, and an intimate knowledge of the various kinds of work involved. In effect he is the supervisor's mechanical expert and may usually be depended upon to fix anything from an intricate piece of coal-dock machinery or pumping equipment to a bad leak in a pipe line. If he is the right man for the place, he is not hurrying around chasing trouble with a monkey wrench and hammer, but is using his head to anticipate where something is likely to go wrong next, ordering extra parts for that gasoline engine long since out of date but which must be carried along a few years more, anticipating complete failure of the water-column casting that he welded last winter by having a new one on hand ready to go into place, and above all else, keeping his superior officer advised as to the true condition of water tanks, water columns, pumps, and other facilities that need major repairs "this summer" in order to carry through "next winter" safely.

Be generous with this man—get him that welding outfit or pipe threading machine that he has been begging for—he above all others can see where it will bring large returns. Give him a good outfit car in which he and his helper can have a comfortable place to sleep and eat when they are tied up on a repair job at some out-of-the-way place. He should also have a work car and be encouraged to make this not merely a storage place for the pipes and fittings, engine parts, packing, and other articles which are his daily necessities, but a miniature machine shop where he can do an ordinary repair job at once. He will then not have to take all his work to the division shops, which would probably involve a delay of a day or two, whereas the station might otherwise be returned to service in a few hours. He should have a forge, drill press, welding outfit, pipe-threading machine, gasoline driven diaphragm pump, etc., so as to be prepared for any emergency. A few hundred dollars invested in this way will usually bring larger returns to the operating department than any other single item.

Let him have a few days off during his favorite hunting season when everything is running smoothly. He will reward you by faithful work at the critical time next winter when he may be the means of saving the supervisor and the superintendent from embarrassing explanations of serious train delays. He will not complain when duties require that he stay out for long hours, working all night perhaps in some wet hole fixing up an unexpected break to provide water for the next train.

Operating Department Should Co-operate

The water-service foreman should be located either at division headquarters or at a day-and-night telegraph station where he can be reached at all hours by the chief dispatcher by telephone. Alert trainmen coming over the road will acquaint the chief dispatcher with defects which they notice so that he in turn may promptly get the water man out to the seat of the trouble. Even holding the "Limited" for a few minutes or stopping it at "Podunk" may be justified in order to get this man to the trouble before something else may go wrong.

Perhaps no one from the superintendent down fully appreciates the value of keeping the water supply ready to function 100 per cent at all times until he has had the opportunity to go out on a snow-bucking expedition and has been tied up in some snow-filled cut 5 or 10 miles from the nearest water station, where, with the wind blowing a gale he has been one of those who had to wield a scoop shovel to keep the outfit alive by shovelling snow into the engine tender. The water-service man cannot be spared for such trips. He must keep his mind on the water supply and maintain close touch with the situation through the dispatcher's office. It is up to him to anticipate trouble, for example, at XYZ station, which is located between stations and is operated by the section foreman and, if necessary, manage to get there by some circuitous route best known to himself, so that before others give any thought to it he will have the plant thawed out and water ready when the snow-bucking train arrives. Service of this kind is seldom rewarded as it should be, but it is only one little detail in the regular tour of duty of the faithful water service man who is alert to all the possibilities of his job and is doing his part to keep the transportation machine functioning as nearly perfect as possible under these trying conditions.

Beware of February

As winter draws to a close and February sunshine begins to reduce the accumulated ice and snow and the operating officers begin to rest easier, it seems that "Jack Frost" often takes one final fling. This is the period when pipe lines and valves which have not given trouble all winter will often freeze, water tanks will spring new leaks, and other troubles will show up. It appears that as the frost is disappearing at the surface, it penetrates just a little deeper into the ground; and, as the ice in the tanks starts to melt, slight expansion takes place which spreads the staves and starts fresh leaks. This again is the time when special care is required, especially in regard to water columns and storage tanks, but this period is brief and we are soon back in the season when all concerned may vigorously resume their efforts to place all water facilities in shape to defy another cold winter.

Now You Can Beat a Blizzard

Snow-fighting devices simplify problems in terminals where intricate track and switch layouts intensify the effects of severe storms

SENDING the track forces home at the moment when a record-breaking snow storm is at its worst seems an astounding thing to do. Yet the Chicago & North Western did this on Saturday evening, March 7, 1931, leaving only three repairmen in charge of one of the most important interlockings on its system over the week end. The reason that it was able to take such surprising action lies in the fact that it had equipped this interlocking with switch heaters which had demonstrated their ability to keep the switches clear despite a combination of heavy snowfall and high wind.

Since the railways first came into existence, no feature of their work has been dreaded more by maintenance officers and men alike than that of fighting snow. While major difficulties in this respect are often encountered out on the line in heavy snow territory, it is in the terminals, with their intricate track and switch layouts and their numerous interlockings, that heavy falls of snow create the most difficult problems for the snow-fighting forces. These problems are not confined to the duration of the storm, since in many terminals the disposal of the snow after the storm is over is a matter of urgent necessity, which largely increases the cost and has often taxed the ingenuity of the maintenance officers in devising means to accomplish this disposal in a reasonable time.

Formerly Relied on Manual Methods

Attempts have been made to blow the switches clear of snow with steam. This method has never received wide acceptance, however, one reason being that it requires the services of too many locomotives in large terminals. Other methods have also been tried from time to time with different degrees of success and abandoned in whole or in part. Until very recently, therefore, reliance has been placed almost wholly on manual methods, using snow brooms and shovels for keeping the switches clear. When a storm struck, the regular forces were augmented by the employment of such casual labor as was deemed necessary, or was available. The addition of these untrained and practically unorganized forces and the necessity of feeding them, particularly at isolated points, increased the burden on the supervisory forces at a time when they were under extreme pressure to keep trains moving.

As contrasted with these manual methods of fighting snow in railway terminals, which were almost universal up to as recently as two or three years ago, and are still the usual practice on many roads, maintenance officers now have at their command a variety of snow-melting and other snow-fighting devices which have demonstrated their effectiveness under the most adverse conditions of heavy snowfall, high wind and low temperatures. Installations of snow-melting equipment in the Chicago terminals of several of the roads entering the city made it possible for these roads to keep their trains moving practically on schedule throughout the entire period of the severe blizzard of March 7, 1931, which was one of the worst storms that ever struck the city. At the same time, traffic was all but tied up on other roads that relied entirely on manual methods and was seriously hampered on others, despite the employment of large numbers of extra men.

While efforts have been made for two decades or more to devise dependable methods of fighting snow, it is only recently that equipment that is satisfactory under all conditions of storm has become available. It has been amply demonstrated, however, that the devices which have been developed in the last few years for melting the snow at switches and interlockings as it falls, make it practicable to reduce or eliminate the manual effort required to keep the switches clear and, incidentally, the amount of casual labor that has heretofore been necessary. Likewise, effective equipment is now available which can be used to remove economically the accumulations of snow in yards, around team tracks and from driveways.

Fully as impressive as the effectiveness of the installations already mentioned, in preventing train delays and

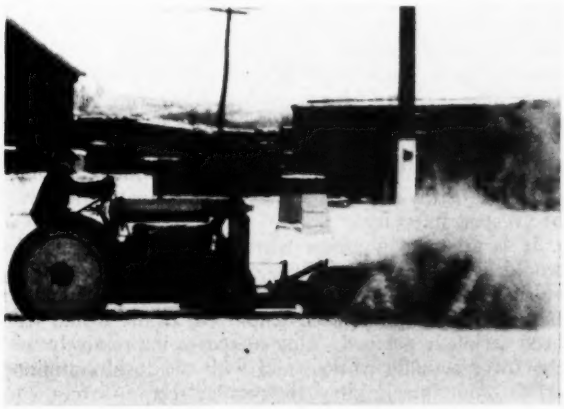
tie-ups during the blizzard of March 7, 1931, were the savings that were realized through the use of the snow-melting devices. It was demonstrated during this storm that the reduction in out-of-pocket cost for keeping the line open during this one storm ran as high as 20 per cent of the cost of the snow-melting equipment. To this easily determined sum must be added an equal or probably larger indirect but indeterminate saving in transportation costs through the elimination of train delays and interruption to traffic.

Three Classes of Melters

Snow-melting equipment may be classified, as to types, as portable, semi-portable and fixed. The first type comprises such equipment as can be carried by hand or moved under its own power from point to point as needed. It includes hand torches that are equipped with portable fuel reservoirs or that can be connected by hose to stationary fuel tanks, cans from which burning fluid is poured on the snow or the rail, and weed burners in snow-melting service. The second type is represented by those devices which consist of a fuel reservoir and combustion chamber. They are placed in position at the switches upon the approach of the storm and used in the same way as the fixed melters, but are removed when the storm is over. The fixed type embraces those units which are installed at or applied to the switches at the beginning of winter and remain in this fixed position until all danger of snow is over in the following spring. The heat for this type may be supplied by means of electricity, oil, gas or steam. To these mechanical devices there should be added a fourth, or chemical, type, which comprises snow-melting salts having low-freezing points when in solution and which heat while going into solution thus adding to their power to melt snow.

An Opportunity for Comparison

Probably no better opportunity will ever be afforded to make a comparison between manual methods and costs and the application of these newer devices for fighting



Revolving Broom Clears a Shop Driveway

snow than was presented in the last two years in Chicago. During the first of these winters, two major storms, each with record-breaking snowfall, occurred, one in December, 1929, and the other in March, 1930. Each storm was of about 72 hr. duration and each was accompanied by high winds that drifted the snow badly. The first brought a fall of 14.2 in. of dry snow, an all-time record for a single storm at this point, and a temperature of about 18 deg. The snowfall in March was still greater, amounting to 19.1 in., but as the temperature remained near the freezing point, the snow was wet and packed solidly in the drifts.

In both of these storms, every form of local transportation was completely paralyzed, except the railways and elevated lines, and they were so seriously handicapped that they just escaped complete interruption to their service. The only exception was the Chicago Union Station, which was able to provide for all train movements, amounting to about 1,600 in 24 hr., without in-

Opening a Yard With a Spreader

terruption and with practically no delay. Such delays as did occur to trains were the result of conditions outside of the station area.

The station layout comprises more than 12 miles of intensively used tracks, in which there are 47 double-slip switches and 58 turnouts, all interlocked and controlled from two interlocking towers. Track centers in this terminal do not exceed 13 ft., except in the trainsheds. During the summer of 1929, partly as an experiment, four double-slip switches near the throat of the south approach tracks were equipped with fixed switch heaters which use commercial gas. Two switches were equipped with stationary steam snow melters, but these were not entirely satisfactory. Semi-portable oil-burning heaters were also installed at a number of slip switches. They were successful in keeping the switches clear but, owing to the small oil capacity of the type used, the frequent train movements, the close track centers and the necessity of frequent filling, they were not entirely satisfactory for the conditions in this terminal. The remainder of the switches were kept open by means of large portable suction-type, self-generating oil torches, connected by means of removable hose lines to fixed outlets, which led to stationary oil tanks of large capacity.

No Casual Labor Required

Owing to the variety of types of snow-melting equipment in service, it was not practicable to determine the relative economy of the several types. For the first time, however, no casual labor was required, all of the men being regular section men or station employees who were familiar with their duties and with the operating conditions in this area. The regular section force was considerably increased, however, by calling out a large number of other station employees.

As a result of the successful operation of the fixed heaters and the minimum amount of attendance they required, this installation was extended in 1930 to include about 60 per cent of the interlocked area. At the same

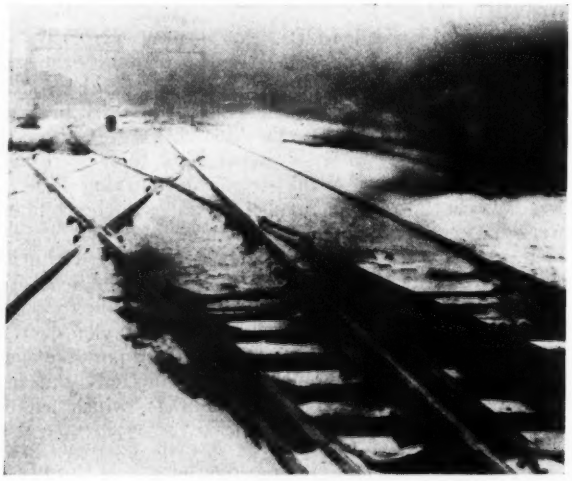
time the Chicago, Milwaukee, St. Paul & Pacific made a similar installation at its Western Avenue interlocking. The Chicago & North Western also installed the same type of switch heaters at four of the six interlockings, including the large Lake Street plant, which control train movements in the vicinity of its passenger station.

During the following winter, there was no snow of consequence until March 7, 1931, when, without warning, a blizzard of unusual intensity struck the city. While it had been cloudy on the morning of this day, there were no indications of a storm, until a light snow began to fall at 11 a. m. By 11:45 a. m., however, the storm developed to major proportions, and during the next 39 hours the snowfall amounted to 16.4 in., the second heaviest on record for the city, while high winds of gale force drifted the snow badly.

The railways were caught entirely off their guard and many of them experienced extreme difficulty in organizing their forces. This was particularly true of those roads that were working their track forces only part time and had no men on the ground at the beginning of the storm. The situation was further intensified by the fact that, while each of the two storms of the previous winter lasted 72 hr., the duration of this storm was but little more than half that time. In addition, railway men of long experience had never seen snow fall so rapidly as it did for about three hours late in the afternoon of Saturday, the first day of the storm.

The Chicago Union Station

At the Chicago Union Station, the regular section force of 2 foremen and 15 men was divided into day and night shifts and was able, without other help, to attend the fixed switch heaters and keep the remainder of the switches clear with the suction torches. The fixed installation cost approximately $30,000, but comparing the cost of this storm with that of March, 1930, and remembering that neither casual labor nor manual methods was employed during the earlier storm, there was a saving of $2,000, after including the cost of the 1,500,000 cu. ft. of gas consumed. Of more importance, however, no train entering or leaving this terminal was subjected to any delay by snow conditions at turnouts or slip switches. It is doubtful if complete interruption to service could have been avoided, if reliance had been placed on manual methods, while the hazard of personal injury to a large force of untrained casual laborers would have been extreme, owing to the frequency of the train movements, the close spacing of the tracks and the many diverging routes.



Switch Heaters Demonstrate Their Value

At Western avenue, the Milwaukee and Pennsylvania, each having two tracks, cross the four-track Omaha line of the North Western. Two of the tracks of this latter road are assigned to passenger service and two to freight. The four tracks of the other two roads are operated jointly, a similar segregation of service being made. The installation of switch heaters at this plant cost $17,000.

In the past, not less than 150 men have been required at this plant during storms of moderate intensity, while experience indicates that for a storm as severe as that of March, 1931, 500 men would have been needed. In contrast with these forces, eight men were able to light the burners and adjust the flame and care for them thereafter.

Under manual methods, it had been customary to abandon the freight tracks and concentrate all efforts on keeping the passenger tracks open, yet delays to passenger trains were numerous and derailments common. No difficulty was experienced in keeping all tracks open by means of the switch heaters during the period of the storm; there were no train delays chargeable to the operation of the interlocking and no derailments occurred.

The reduction in the cost of keeping the line open at this point was fully as impressive as the improvement in the operation of the plant. In the storm of March, 1930, the only one comparable to that of March, 1931, the cost of labor and supplies was $3,962.04, while in March, 1931, the cost of all labor and supplies, including the gas consumed, was $1,095.48, a reduction of $2,866.56, or 17 per cent of the cost of installation.

North Western Sends Its Men Home

Fundamentally, the experience of the Chicago & North Western was the same as those of the roads already mentioned. There are several junctions and diverging routes within a short distance of its passenger station, and there is an intricate track layout approaching the station. For these reasons, as well as because of its exposed situation and the large number of train movements within the terminal area, this road has always suffered severely from snow storms of any intensity. During storms of more than average severity it had been necessary heretofore to employ about 900 extra men working in three shifts at these four interlockings, while 50 men additional were frequently required at Lake street during the period of greatest intensity.

It is an open question whether a force of this size would have been sufficient to cope successfully with the storm of March, 1931. In any event, it is certain that, had manual methods been employed, trains would have been seriously delayed. This compares impressively with the force actually worked and with the results attained. At the four interlockings the regular section forces, consisting of a foreman and 5 trackmen at each plant, were not increased. Assisting the interlocking repairmen who are regularly employed at these plants, they were able to attend to the heaters during the day. At 5 p. m. on Saturday, while the storm was still at its worst, the gangs at three of these plants were released and did not return to duty until Monday morning, the heaters being looked after during this interval by the repairmen. The fourth gang was held through Saturday night, but was released from Sunday morning till Monday.

Typical of the results obtained by other roads, the Illinois Central installed the semi-portable type of switch

heaters at 237 main-line turnouts, 4 single-slip switches and 41 double-slip switches. Eighty regular trackmen were required to attend this installation of switch heaters and keep them filled with oil. This was the only force employed during the entire period of the March, 1931, storm, as compared with an average constant force of 736 men which would have been necessary had manual methods been employed. Based on previous experience, if manual methods had been employed, however, there is no assurance that train delays would not have occurred. As it was, no train was delayed at any switch that was equipped with this type of heater, while the reduction in cost, as compared with manual methods, was $7,032, this being well in excess of 20 per cent of the investment.

Weed Burners Melt Snow

At Markham yard, this road was able to keep 514 switches and 200 car retarders in service at all times through the use of three weed burners for melting snow. One of the weed burners was sufficient to keep all of the car retarders and switches on the hump and in the diverging routes clear of snow. This hump was, therefore, in condition for service during the entire duration of the storm, while other roads not provided with snow-melting equipment, were compelled to suspend hump operation for varying periods, owing to accumulations of snow in the braking mechanism.

As a further indication of the effectiveness of this method of fighting snow, it was unnecessary to increase the regular section force of 35 men, except during the final hour of the storm at which time the rate of snowfall had decreased materially. At this time one of the weed burners was damaged, after which, in order to keep the switches open, it became necessary to rush 80 extra men to the section of the yard in which it had been working.

In this connection, another Chicago road, which has a large switching yard some distance outside of the city, had an installation of fixed oil-burning switch heaters to serve its car retarders and hump switches. This equipment proved to be particularly effective in an exposed situation, under extreme conditions of high wind and heavy drifting, although no figures are available to indicate the economies that were realized.

One road, the Baltimore & Ohio Chicago Terminal, made use of a special snow-melting salt, which was effective in removing accumulations of snow and ice on the shoes and bridge seat of its bascule-lift bridge over the Chicago river, but employed no other snow-melting aids elsewhere on its line.

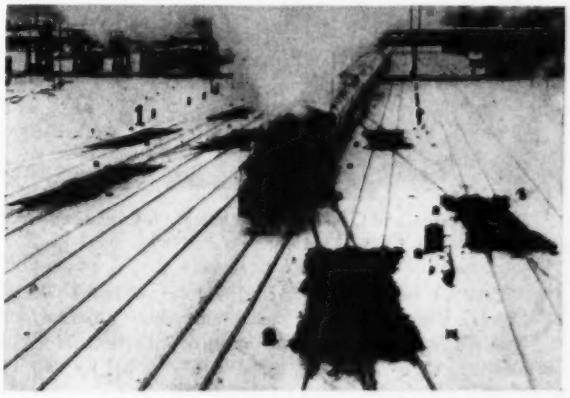
Recovering from the Storm

When the storm ceases, the work of the maintenance forces is relieved only momentarily, if the snowfall has been heavy or there has been much drifting. Accumulations of snow in yards, around interlockings, in team yards, on driveways and elsewhere in the terminal area must be removed. In the past, the disposition of this snow, as well as the methods by which it could be accomplished, has often been a real problem. In recent years, however, equipment has become available, through the use of which such accumulations can be removed quickly and with relative economy.

It has been demonstrated that modern spreader equipment can be used effectively in yards and on main tracks to clear away the snow. In yards, the snow can be plowed from five or six tracks on both sides, ridging the snow up on one track left temporarily out of service for this purpose. By repeating this process at similar intervals, the entire yard can be cleared in a short time, thus making possible a quick recovery from the severest conditions.

Crawler-mounted and industrial tractors can be adapted for clearing off-track facilities, such as driveways around stations, freight houses, team yards, shops and elsewhere in the terminal area. To make this adaptation, special attachments such as push plows or rotary brooms are necessary, but these are readily available.

Removal of the piled-up snow in yards can be accomplished with relative economy, as compared with hand methods, by means of cranes equipped with clamshell buckets. Disposal of that from team yards and other areas adjacent to tracks can be made in the same way. It is often practicable, however, to pile snow from other driveways in such a manner as not to interfere seriously with the use of these facilities, in which case it can be allowed to melt away. Where neither of these methods



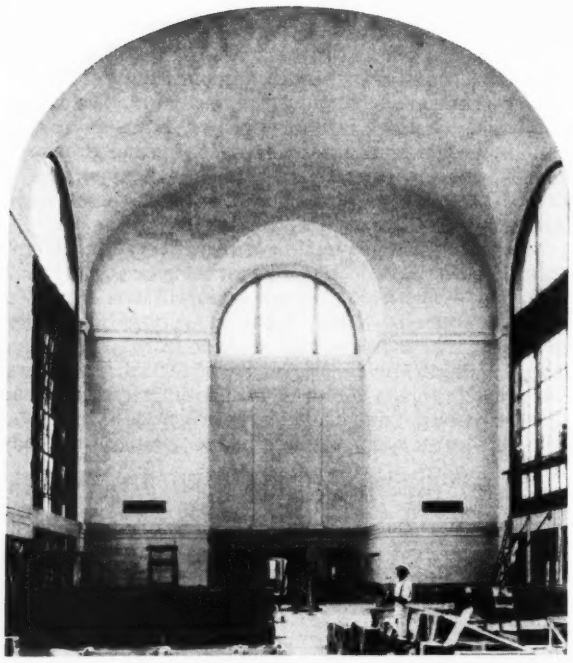
No Trains Were Delayed at These Switches

is practicable, portable snow loaders, which operate under their own power, of the type used for snow disposal on highways and city streets provide a simple method of loading the snow into motor trucks.

Most of the equipment that has been mentioned in connection with snow disposal is already available on the railways. With a little resourcefulness, maintenance officers can adapt it for this class of work and thus shorten the interval of recovery as well as realize attractive savings.

Through the use of the wide variety of snow-melting and other snow-fighting and snow-disposal equipment which has been developed in recent years, much of the drudgery that has heretofore been considered a necessary accompaniment of snow storms, can be eliminated. Furthermore, the uncertainty that is always present with respect to the rapid expansion of the forces, the hazard of personal injury to untrained and largely unorganized casual laborers, and the proper disposition of the extra forces, can be diminished almost to the vanishing point.

Experience has also demonstrated that they are effective in preventing delays to trains and the frequent derailments which result from snow-clogged switches. They have attained these results under the most severe conditions of snowfall, wind and temperature. Not the least of the advantages with which the various types of equipment can be credited is that of marked economy, as compared with methods previously in vogue. The various installations of snow-melting equipment alone reduced the requirements for extra labor in the Chicago terminals during the March, 1931, blizzard by the equivalent of 5,683 men for one 8 hr. shift, while the indirect savings in improved operating conditions were estimated to have been equally large.



Redecorating and Cleaning Station Interiors Is Considered Winter Work on Many Roads

Keeping Building During the

Several roads, appreciating the value of stable forces, carry out many kinds of work during colder months without difficulty or disadvantages

RAILWAY building work can be done, should be done, and to a large extent is being done, during the winter months, according to the maintenance officers of a number of roads. In fact, there is a general unanimity of opinion among officers of these roads, that the spreading of building work through the year offers distinct advantages over strictly seasonal employment and can be practiced with economy to an even greater extent than is being done at present or has been done in the more nearly normal times in the past. That there are physical limitations to the carrying out of certain classes of building department work during the winter is generally recognized, but on certain roads at least, the importance of these limitations has been greatly minimized, and classes of building work are now being done which, in former years, were considered inadvisable or impossible.

Value of Stable Forces is Recognized

On many roads much more latitude in the programming of maintenance work under budget appropriations has been allowed during recent years, thereby permitting much more work to be done during the winter, with a corresponding increase in the stabilization of forces, but there are still other roads which hold to the policy that the curve of maintenance expenditures should follow closely that of earnings, regardless of the magnitude or extent of the fluctuation. However, even on these latter roads, it is not uncommon to find that maintenance officers are not in full accord with the policy of enforced fluctuation in building department work and are convinced that this policy leads to a decrease in the efficiency and economy with which their departments can function.

Viewing winter building work strictly from the standpoint of practicability, there are several distinct questions which have to be taken into consideration. In the first place, is there sufficient building work on a road to warrant or to require the maintenance of a uniform force throughout the year, especially where such a policy would result in too small a force in view of the volume of work that could be done more economically during the spring, summer and fall months? Secondly, are conditions over the line during the winter conducive to effective building work? Thirdly, does the stabilization of employment in the building department reflect appreciable benefits upon both the men and the railway?

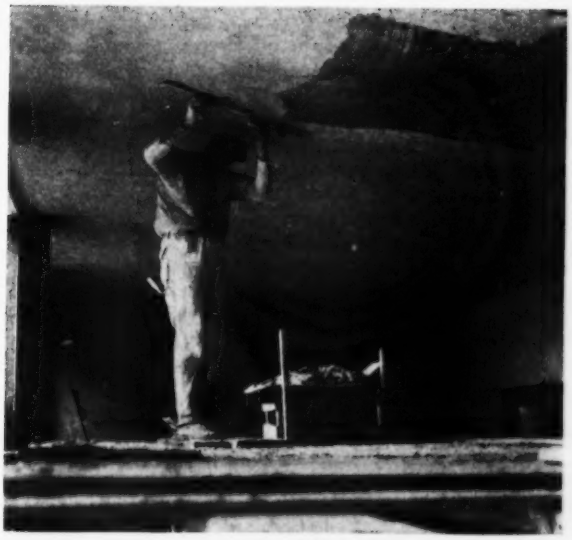
In approaching these questions, particularly in recent years, the last mentioned factor is usually given primary consideration, even among those roads which find it impractical for one of the other reasons to spread out their building work uniformly over the year. This is reflected in answers to questions concerning the desirability of stabilized building forces given by maintenance officers of those roads which do not go all the way in this respect. Their answers are, almost invariably, along the line of the following: "We appreciate the desirability of stabilizing employment in the building department and it is our policy to go just as far in this regard as we feel that we can, but because of ....., and for the further reason that ....., we have not been able to carry out this policy to the full extent."

The sincerity back of such a general expression of opinion is appreciated when it is understood that most roads, judging from the experience of a considerable number in the East, are not particularly concerned about being able to build up their building forces with experienced men after a seasonal or temporary layoff. This is true even in years when labor in general is not plentiful and in spite of the fact that the wage scales for building men, such as carpenters, plumbers, tinsmiths, masons, etc., are usually lower on the railways than in the industry generally. This is the result of a policy on many roads of letting their best and most experienced men out on furlough when it becomes necessary to cut forces, rather than to cut them off the payrolls entirely. As a result, the men retain their seniority and are glad to take back their jobs, not infrequently giving up employment assumed, even at a wage somewhat higher than that paid by the railroad.

Weather and Amount of Work are Factors

Agreeing that stabilized forces are desirable, the main considerations of the maintenance officers canvassed seem to be, whether there is enough work to warrant uniform forces throughout the year, and whether the winter conditions encountered are conducive to the effective and economical performance of the work. On the question of

Forces Busy Winter



Plastering Is an Inside Job that Can Be Done in the Winter

the amount of work, the line is drawn quite distinctly between the larger roads and the smaller roads, although the size and extent of terminal properties have an important bearing. In regard to the climatic conditions in which building operations are feasible, the line of distinction is not so clearly drawn, certain roads classifying certain building operations as summer work, while other roads in the same general territory, or traversing an area of even more severe climatic conditions, have long considered the same operations as suitable for either the summer or winter months. In general, temperature is a factor of decreasing importance in the stabilization of the building forces, but the problem of snow still continues to have an important bearing in practically all cases, particularly with respect to work out on the line.

Among the roads in and about the East which were approached in connection with the investigation made immediately preceding the preparation of this article, those which have been most successful in extending their building work over the entire year are the Pennsylvania, New York zone, and the Delaware & Hudson. Other roads, including the Delaware, Lackawanna & Western; the New York, New Haven & Hartford; and the New York Central, make a sincere effort to carry out considerable building department work during the winter months, but have not gone as far as the two other roads mentioned. Of these roads, however, the extent to which winter work is carried out varies considerably, as does also the degree with which it has been possible to stabilize building forces.

Summer and Winter Alike on Pennsylvania

In the New York zone of the Pennsylvania, which extends from the eastern tip of Long Island, through New York City, to Liddonfield, Pa., about 15 miles east of Philadelphia, and particularly on that part of the zone within and about the metropolitan area of New York City, winter conditions have relatively little effect upon the operations of the building department. In this territory the winters are usually quite open, and severe snow storms are infrequent, but the temperature during most of the winter is around freezing and quite frequently drops within a range between 15 deg. F. and zero.

Traversing a highly developed section of the country, where general building work has long ceased to be seasonal, the Pennsylvania has become fully imbued with the ideas held by general building contractors in this regard. In other words, work on the New York zone is an all-year-round job, and while some items, such as interior work, is obviously better suited to the winter season than certain other classes of work, there appears to be little change in the character of the work throughout the year. Ordinarily, the work is done when it is required, and what is considered summer work on certain roads is done just as effectively in the New York zone in January or February.

It is true that certain conditions are taken into consideration during the winter which are not encountered in the summer. If there is snow, it may have to be removed, and if it is too cold for the pouring of concrete in exposed areas, heating of the materials and the protection of the structure become necessary. However, where such measures are necessary, they are considered the means to an end, and by resorting to them, which in most cases involves little additional expense, the road secures all of the benefits of a practically stabilized building force and of keeping up with its large building program.

One of the most important factors bearing on winter building work, so far as the New York zone is concerned, is the volume of building work which is required on this section of the Pennsylvania. It is said, that from the standpoint of buildings and building maintenance, the Pennsylvania's facilities in and about New York are more extensive than those of any other road in this area, and, possibly more extensive than those of any other road, in a similar area, in the country. With warehouses, freight houses, dock facilities and several hundred acres of piers scattered about the metropolitan area on both the North and East rivers, and in New York harbor proper, in addition to large passenger stations in Manhattan, Jamacia, L. I., Jersey City and Newark, N. J., and at other points on its lines, the building department of the zone has a maintenance program which it would be most difficult, if not impossible, to crowd into the summer months. Years ago, when building activity was less intensive in this area, carpenters looked for inside work during the winter, while masonry work was completely at a standstill from the first of November until the latter part of April. These conditions have changed entirely, and today building work in the winter is affected only by the amount of work to be done and the amount of money appropriated.

Many Classes of Work Are Possible

The Pennsylvania programs its building work early each year, listing all of the major maintenance and repair operations which can be forseen as necessary in the current year, and allowing adequately for routine mainte-

nance and for the emergency work which is certain to arise. In its program, the month or season in which the work is to be done is not specified, it being left entirely to the division supervisory forces to decide when the different items are to be undertaken. Usually, the deciding factors in determining the time at which specific items of work will be started, are the urgency of the work and convenience, weather conditions having only a minor influence except in certain cases. In other words, those in charge of the building work on the zone have found that they can carry out practically 95 per cent of the necessary building work just as effectively in the winter as in the summer, which obviates the necessity for making a careful differentiation in the program with regard to what work shall be done during the different seasons of the year.

The fact that the New York zone carries on its work during the winter does not mean necessarily that its building forces as a whole are entirely stable throughout the year, although a distinct effort is made in this direction. Quite logically, the forces are enlarged as the amount of routine work increases, or as additional work is taken on. However, the basic forces in the different parts of the zone are maintained practically intact, and additional labor is hired only as conditions may require. In other words, it is entirely possible that the building force may be larger in the winter than in the summer, although ordinarily, this is not the case.

Some of the Work Done

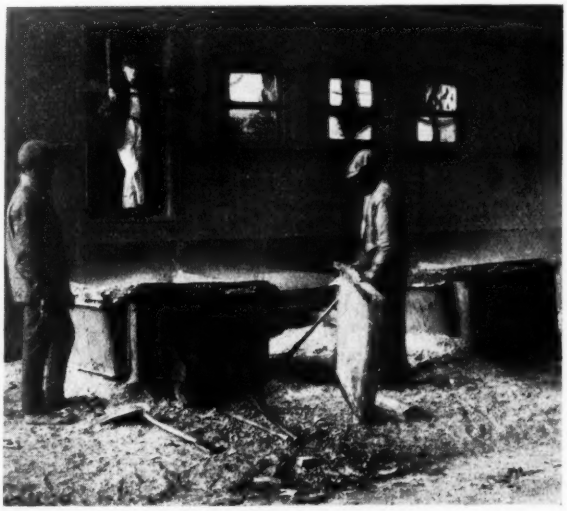
To give an idea of the character of the work done by the building forces of the zone during the winter, it is much easier to mention the few classes of work which are not attempted during the cold months. The few exceptions include primarily, exterior painting, work requiring excavation in frozen ground, certain classes of concrete repair work, and certain classes of concrete construction, usually where the concrete sections are small and spread out, as is the case with concrete curbing, which it would be difficult and expensive to afford the necessary protection against the cold.

In practically all other cases, building work in the New York zone goes on without uninterruption during the winter. Concrete work is done in ash pits and scale pits, for example; roofs are repaired when necessary, and if the occasion should arise, entire roofs are renewed on unheated buildings, taking the usual precautions, of course, that are necessary during any part of the year, to insure that the new work may be closed in quickly with the old in the event of a storm. Platform and floor work, both repair and renewal, are done where necessary, regardless of weather conditions, and practically the same practice prevails with regard to work on piers and pier structures. The maintenance of passenger and freight stations, engine-houses, car and locomotive shops and miscellaneous terminal buildings presents no problem whatever in the New York zone during the winter.

D. & H. Maintains Uniform Force

On the Delaware & Hudson, where conditions are decidedly less favorable for winter building work than in the New York zone of the Pennsylvania, an even greater and more concerted effort is made to stabilize the forces in the building department, this being in line with the general policy of the road with respect to employment in all departments. To a large extent, the practice of the D. & H. is an answer to those roads which restrict building department work during the winter, either because of weather conditions or because of insufficient work to make winter operations imperative.

With approximately 900 miles of lines, extending from Scranton, Pa., north through Albany to the Canadian border, the Delaware & Hudson is faced with practically all of the situations which are cited by certain roads as factors that militate against winter building work. In the first place, with an average temperature over its lines during the winter of around 21 deg. F. and an average depth of snow throughout its territory of from 20 to 30 in. from January to March, conditions cannot be said to be particularly favorable from this standpoint, and secondly, the amount of building work to be done annually on this road, could, with the exception of winter emergency work, be quite easily crowded into the spring, summer and fall months. Yet the Delaware & Hudson chooses to spread out its building work over the 12 months of the year, and finds distinct advantages in doing so, based on the experience of the last six years during which time this has been the practice.



Repairing Asphalt Platforms Under Cover

Work is Carefully Programed

Each year this road prepares a program of its appropriation building work, not alone for the year as a whole, but broken down and suitably divided to spread the work over the year. Work requiring urgent attention is normally given preferred consideration during the most favorable time of the year, regardless of its character, but, at the same time, specific items of work which can be delayed and done just as effectively during the winter, are definitely scheduled for the winter months.

Work of this character includes repairs to ice houses; interior plumbing and plumbing repairs; interior painting and decorating work; the dismantling of abandoned buildings; repairs to ash pits; repairs to the foundations, floors and stairways of stations, freight houses, shops and similar buildings; general repairs to engine terminal buildings, and, in fact, to all buildings to be painted in the spring. These classes of work, supplemented by emergency repair work, keep the building department employees occupied during the winter. No attempt is made to carry out exterior painting, concrete work, roofing or repairs to underground pipe lines, these classes of work being scheduled specifically for completion during the warmer months of the year.

As an aid in the problem of having enough work to keep a force of modest size employed continuously, the D. & H. does practically all of its building work with its own forces. When conditions demand the curtailment of a certain amount of its scheduled work, this road reduces the working hours of all of the men rather than laying off a part of them.

According to maintenance officers of the D. & H., the results of its practice of providing continuous employment for its building forces are increased morale and greater skill and efficiency among its men, and reduced accident hazard. Furthermore, they are convinced that these factors result in the more careful planning of the work, a higher class of work, a larger output per man-hour employed, and, in the final analysis, improved general building maintenance throughout the year.

Other Roads Try to Stabilize Force

On the New Haven, the Lackawanna and the New York Central, the theory of stabilized forces in the building department is adhered to, but, in actual practice, there is some variation between the size of the building force maintained in the summer and in the winter. On these roads, the winter force ranges from 75 to 85 per cent of the summer force and averages about 20 per cent less than the summer force.

All of these roads program their building work, leaving a certain amount of the work for completion during the winter months, but, in general, on the principle that what can be done in the winter, with few exceptions can

Mass Concrete Work, Which Can Be Readily Protected, Forms a Regular Part of the Winter Work on Some Roads

be done during the spring, fall and summer just as effectively and economically, and possibly more so in certain cases, an effort is made to clean up the major part of the program work during the warmer months of the year. Ordinarily, however, enough work is held over, which, with the routine maintenance and emergency work which arises, is adequate to provide continuous winter employment for all the older and more experienced employees. When conditions beyond the control of the maintenance department make it necessary to retrench beyond the point where it is possible to keep all of the older employees in full-time employment during the winter, it is the general practice on these roads to spread the necessary cut in man-hours over all or certain classes of the building forces by reducing the number of days worked during the week.

Following this practice, the more efficient employees are continued in the service, which is one of the principal factors sought in the stabilization of forces, while, at the same time, an opportunity is afforded for weeding out less efficient or less desirable employees. Some roads have found this latter consideration of real value and one road, in particular, feels that the relatively small reduction which it makes in its forces in the winter works no particular hardship on the men concerned, since many of those affected, while willing and capable of doing a fair grade of work for a time, are glad to be relieved of employment for a part of the year, particularly during the colder winter months if outside work is required of them.

Some Work Done, Some Avoided

In general, winter building work on the New Haven, the Lackawanna and the New York Central is made up of interior carpenter work and painting in stations, freight houses, and office, shop and engine terminal buildings, and heavy timber repairs on piers. In addition to these general classes of work, the Lackawanna considers some classes of concrete construction practical, and also brick laying under favorable conditions. These specific classes of work supplement, of course, minor routine repairs and emergency repairs which occupy a considerable part of the time of the men.

The various classes of building work which are generally avoided during the winter months on these roads include outside painting, reinforced concrete work, particularly where small sections are involved, masonry pointing, roofing repairs and foundation and pipe-line excavation work. The Lackawanna also considers it inadvisable to make repairs to the interiors of enginehouses during the winter, especially above the floor level, because of the fact that with the doors closed, as is usually the case during cold weather, conditions are not as favorable for the men or for turning out efficient work as during the warmer months of the year when the doors are open.

All of the roads mentioned in this article agree that it is highly practical and necessary to program building work, and to arrange for a certain amount of the work to be done during the winter. Furthermore, they are convinced that no serious disadvantages are imposed to this practice and to the stabilization of employment in the building department throughout the year in so far as is practical. They appreciate, however, that certain special precautions are usually necessary in connection with winter building work. Some of the more important of these may be listed as follows: Special precautions when doing any kind of masonry work to prevent damage to the concrete or mortar; extra precaution on the part of the men engaged in outside work because of the less freedom of movement possible when dressed in heavy clothing; special care in moving about and handling materials outside where snow and ice have made the material slippery and footing insecure; and increased vigilance in the operation of motor cars, where such are used, because of the use of shields, poorer visibility at times, and the natural inclination of the men to turn their heads from the direction of travel to shield their faces from the wind.

A Real Safety Record—Pete Wilmoth, section foreman on the Panhandle-Indian Territory division of the Chicago, Rock Island & Pacific at Aline, Okla., has completed 30 years of service without a reportable injury or a derailment.

As told by
ARMSTRONG CHINN
Chief Engineer, Alton,
Chicago

Keeping the Line Open

A statement of the measures to be employed prior to and during severe weather to insure continuity of operation outside of terminals

REGARDLESS of the season, the task of keeping the line open is the primary duty of the maintenance of way department, and winter, with its increased hazards of operation, imposes additional difficulties in carrying out this fundamental necessity. Preparation for winter must commence with the maintenance season and be carried along actively with other maintenance work to insure a minimum amount of trouble during cold weather. Schedule speeds must be maintained in winter as well as summer and that necessitates a standard of track that will not vary in quality to any extent with the seasons. The things that must be done to achieve this end are characterized chiefly by their number and variety rather than by any marked change in practices that have been followed for years and which are thoroughly known to those who have been through a few hard winters.

Probably the most important factor in securing good riding track through winter months is to get the tie renewal program and reballasting completed in time to permit track forces to do a good job of smoothing and lining before the ballast freezes. All ties put in during the current season should be sounded, and if found loose should be tamped to a firm bearing against the rail. Failure to do this may leave the rail with uneven support which is one cause of broken rails. If pressed for time due to reduced forces it may be necessary to tighten spikes on the line rail while smoothing the track, and leave the gaging of the other rail and the tightening of bolts until the track is frozen.

The drainage problem is one that is ever before the maintenance department and must be given its share of attention if the desired results are to be obtained. Ditches must be cleaned, obstructions removed from culverts and waterways, debris removed from catch basins and drain pipes around stations and yards, and good drainage provided at water cranes, highway and street crossings, and railroad crossings. A wet roadbed usually results in heaved track following the first hard freeze. In cuts, and occasionally in fills, this condition may be remedied by placing tiling or other types of drains. Work of this nature, as a rule, requires special authority so that the roadmaster or supervisor should have his most troublesome places in mind and take care of them as authority can be secured. Heaving track around water cranes and road crossings and over shallow culverts can be reduced and often cured by removing the ballast from the cribs between the ties and placing three or four inches of coarse salt in the cribs. The filling of the cribs is then completed with ballast and the surplus ballast is held for reinsertion in the cribs as the salt melts and percolates into the roadbed, reducing or stopping frost action. Drainage around road crossings, particularly in cuts, should be inspected to insure that mud and dirt cannot be washed on the track where it can freeze, with the possibility of causing derailments.

Less Drifting in Wide Cuts

Railroads that have used spreader or shovel-type ditchers for cleaning cuts and side ditches for drainage purposes, have often found that they derive a secondary benefit from this work that in some cases outweighs the original reason for the expenditure. Experience has shown that in country subject to drifting snow, cuts that have been widened will go through more severe storms before snow drifts clog them sufficiently to cause trouble. A saving in snow fences and in the operation of snow plows results. When cuts do become filled with snow, it is advisable to cut a trench in the snow over each side ditch prior to the first thaw to prevent the water from the melting snow running down the ballast section. This trenching may be done by hand or with suitable work equipment.

Before the ballast freezes, an inspection should be made of switches and interlockings, and the ballast removed from under and around all movable parts for a depth of 3 or 4 in. below the base of rail. This space provides drainage for melted snow and water, preventing it from freezing and hindering the free movement of the switches and interlocking. It has also been found that this reduces the possibility of drifting snow piling up around the rail, while if heaters are to be used, it will facilitate placing them.

Equipment for fighting snow must be checked and put in condition for use sufficiently in advance of its need, so that it may be placed at strategic points along the line in readiness for service. Snow plows, burners, steamers and heavy equipment should be given such mechanical attention as is necessary to assure that there will be no failures in time of need. Smaller equipment, such as snow brooms, snow shovels, torches and the like, should be ordered and distributed for storage under proper supervision, where it will be quickly available when needed. Proper quantities of coarse salt should be ordered and placed at stations for use in providing safe footing on platforms and to accelerate the melting of this ice and snow. Each outlying switch should be furnished with a snow broom, for use by trainmen if necessary. A convenient way of placing these brooms is to insert them handle down in a pipe set in the ground near the switch stand. While equipment is being put in order, a check should be made to determine that flanger signs are placed at all required locations.

Fire protection for outlying buildings and bridges is usually provided in the form of water barrels and buckets, and it is as essential that these facilities be in serviceable condition during cold weather as at any other time. To prevent the water in the barrels from freezing, foremen should be supplied with sufficient fine salt to provide for the dissolving of approximately one hundred pounds in each barrel. Care must be exercised in placing the salt to know that it is fully dissolved for otherwise it will settle to the bottom and be of little or no value. A wooden stick should be placed in each barrel, with which to stir the contents periodically for the purpose of keeping the salt in solution.

Certain territories that are unusually troubled with drifting snow may require snow fences to protect cuts that would otherwise become filled during storms. Experience is the only guide in determining the locations where snow fences are necessary. Two general types of fence are available, the portable and the fixed. The advantage of the portable fence is that it can be placed in locations that must be cleared during cultivation seasons or for other reasons. Where appearance is not a factor, a serviceable fixed fence can be constructed from waste lumber salvaged from the repair yards. Any snow fence must be well set up or the first snow storm will either break it down or cause it to sag until it fails to function properly. It may be added, that in some cases where highways parallel the track, snow fences erected for highway protection have benefitted the railroad to the extent that it has not been necessary for the railroad to erect fences.

How to Use Shims

The question as to the proper use of track shims is one that is always open to debate. The tendency, as a rule, seems to be toward a too generous use of these devices. Track that is properly drained and provided with a full section of good, clean ballast will seldom be troubled with heaving. This desirable condition is not always obtainable and track may get out of surface from frost action or due to soft spots under frozen ballast so that it becomes necessary to resort to shims to restore the surface. However, shims should be used sparingly and only when the track is frozen to such a depth that it cannot be smoothed in the usual manner. The use of shims is further objectionable in that it requires a great deal of supervision to get them all out in the spring. Foremen should be furnished only minimum requirements for this will curtail their use to some extent. At the same time, foremen should be cautioned never to tamp a tie that still has frost under it, for to do so will result in a high spot when frost goes out of the balance of the track. Shims up to ½-in. thick may be used without braces. Thicker shims should always be braced except where only two or three are being used.

In territories subject to low winter temperatures, care must be exercised to see that rail expansion is evenly distributed and that rail anchors are set up well against the ties, to hold the rails in place. If this is not done expansion will become bunched, with the result that during periods of extreme cold rails will pull apart at the joints where the strain is greatest, by shearing the joint bolts.

Co-operation with Operating Department

The operating department has a full share of responsibility in keeping the line open. In fact, a great deal of good work on the part of the maintenance department may be of no avail if the two departments do not co-operate closely. As the weather gets colder, cars do not roll so easily and tonnage ratings should be adjusted in accordance with weather conditions. During times of storm it may be advisable to double-head certain trains, practice which although expensive, is better than having a train stall on a grade or in some cut where it may remain four hours because of a few inches of snow over the rails. If a storm is brewing or in progress, the dispatcher should secure information from the various section foremen as to conditions out on the line before starting trains so that he can better judge as to tonnage and power requirements. In some cases it may be necessary for the train to be preceded by a snow plow. Towermen should be kept advised of the approach of extra trains, and should inform the track forces cleaning the switches as to the time and order in which routes may be required, so as to reduce to the minimum, the necessity for stopping tonnage trains which might thus become snow bound or frozen up. The dispatcher should also see that train orders are put out, instructing train and enginemen to be on the lookout for men working on the track. Trains make less noise when snow is on the rail, and during storms trackmen usually have their caps pulled down over their ears, making it difficult for them to hear trains approaching.

Perhaps nothing contributes so much to the effectiveness of the work of the maintenance department during a storm as a well thought out plan and organization. No two roads can be handled just alike and the supervisory officer in charge must map out a plan to meet the conditions as they are. Each foreman must know in advance just what his duties will be so that he can function without further instructions if his supervisory officer should be called to another part of the line. If foremen may require additional men, they should know where they can be obtained and under what conditions it will be permissable to put them on the payroll. They should know where to feed their men and how to carry the charges. They should have their gangs divided into groups, each group to have designated duties to perform under the direction of the older and more experienced men. New men taken on during storms are usually without experience, sometimes improperly or scantily clothed, and often not in the best condition physically, and it takes careful handling to produce results with safety.

The careful, planning supervisor will have the details on his territory so well thought out and planned for, that when the emergency arises, and the dispatcher makes inquiry as to the running of trains, he will invariably be in a position to reply, "let 'em go."

What Bridge Work in Winter?

Cold weather imposes no problem for some items— For others the case is not so clear

By F. H. CRAMER

Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

AT THIS time, when plans for winter work are being discussed, the most important question to decide is what work can be done in the winter with the same efficiency as in the summer. The subject must be studied very carefully because once a program has been set, the work must go on regardless of whether the winter proves to be a mild one or exceptionally severe.

Owing to the curtailment of many of the items of maintenance work during the past two years by reason of limited appropriations, a large amount of work has accumulated which could well be continued throughout the winter if it were practicable to do so. This is a problem that must be faced, as the bridges must be kept in condition for the safe operation of trains, and if it proves practicable to do such work in the winter it will serve by that much to advance the program of catching up with the deferred maintenance.

An Example of Cold Weather Foundation Work

Structures Must be Well Maintained

The maintenance of bridges entails rather large expenditures each year, and the railways must depend upon the bridge engineer, the division engineer and the bridge supervisor to insure safe operation and, at the same time, to hold expenses to the minimum. Real savings can be made today by close co-operation between division officers and the management. All budget items should be discussed in detail, and the work authorized should be given very close supervision.

To care for such a variety of structures involves large expenditures of money each year for both material and labor, and to apply them in an economical and efficient manner calls for careful planning by the supervisory officers in charge of the work. In these days of low earnings a very careful study should be made of each bridge and building organization and its activities. A general budget should be worked out in detail to cover all the items of renewal and maintenance, together with a complete program of the work to be done in each period of the year and these should be carried out with as little interference as possible. Each unit of the organization should be given ample opportunity to become thoroughly familiar with its part of the program and be given to understand that it is expected to carry out the work according to the schedule.

As a rule all classes of pipe culverts are installed when the weather is mild. However, it has been suggested that this class of work could be done in the winter time for the reason that as the excavation is being made, the sides freeze and stand up so well that shoring is not necessary. This may be true in some cases, but from the standpoint of backfilling there is a corresponding difficulty because the frozen material cannot be compacted as it is placed, with the result that the fill will settle as it thaws out, thereby giving rise to subsequent slow orders. Construction of culverts that involves disturbance of the fill should be carried on in the summer or early fall, while culverts involving tunneling or jacking through high embankments can be installed just as economically in the winter. Hazard to equipment by reason of cold weather is practically nil for this class of work. In jacking or tunneling, a small gas-electric or steam hoist is used to operate the tram cars for removing the spoil and for pulling the pipes into place. In many cases only shovels, picks and wheelbarrows are used, but in many parts of the country little trouble is experienced with the operation of gasoline or steam engines on a large proportion of the winter days.

In so far as pile and timber trestle work is concerned, it is my opinion that timber and hardware can be placed almost as economically in winter as in summer. Today, practically all of these bridges are constructed of creosoted timber, which is shipped out shortly after it has been treated. As a consequence the surface is covered with free oil and the timbers are very slippery to handle by hand. It is true that much of the hardship experienced by the men in handling creosoted timbers on a hot day, has been avoided by the use of small revolving cranes; nevertheless, the men come in contact with the oil in working about or climbing over the timbers after they have been placed, and this makes it rather difficult to do the work economically on hot summer days. In periods of cold temperature, on the other hand, there is less tendency for the oil to exude from the timbers and it is claimed by the bridge men that the oil already on the surface is much less slippery. As a consequence the lining and cutting off of piles and the placing of timbers in a pile trestle can be done as well in the winter as in the summer.

Repair work such as that involved in the splicing of

piles; the replacing of soft caps, sway bracing, stringers, ties, fenders, posts or sills; the relining, resurfacing and tightening up of chords and sway bolts; shimming; the driving of helper piles in pile bents; and the building of frame bents on old pile stubs can be done in the late fall and winter.

Mass Concrete Work

The building of concrete arches, small arch culverts and box-type culverts can be done to a certain extent in the winter at very little additional expense. When the roof, side walls and wings are of heavy construction this class of work can be done with about the same degree of efficiency as in warmer weather and with equal assurance of good concrete, provided suitable provision is made to heat the materials before they are placed in the mixer. In the case of structures involving thin sections, winter work involves the added expense of adequate protection of the concrete after it has been placed in the forms.

Except on extremely cold days, there is no reason why some concrete pile trestle construction cannot be carried out in winter. If the piles and slabs are precast at a central concreting plant, it is only necessary to construct the caps in the field. The building of the formwork and the making of the concrete for these caps is a relatively minor item in the construction of concrete pile trestles, and the heating of the limited amount of concrete material required for the caps, together with the protection of the concrete in the forms, entails little additional expense. After the caps have been completed and seasoned, there is no reason why the slabs, which have been previously cured at the central plant, cannot be placed in the winter at no added cost compared with similar work in the summer. If a suitable quality of ballast is provided, the track on the slab bridge can be readily placed in good riding condition at any season of the year. With proper precautions, concrete retaining walls and abutments can be built with substantially as good results in the winter months. The particular methods to employ depend largely on the character of the work. Mass concrete, of course, does not require the same care and protection as thin walls, columns, beams and floor decks.

Cold Weather Favors Foundation Work

The cost of concrete work will generally run from 5 to 10 per cent higher in winter than in summer, but this is not infrequently offset by the extra expense incurred in summer months by reason of high water and drift. As a matter of fact, piers and abutments for structures at stream crossings can frequently be built at less expense in winter. Winter work for such structures often obviates the building of cofferdams of a sufficient height to meet possible high-water stages of spring and summer months and thereby saves the expense for extra lengths of sheeting, stronger inside bracing, a higher lift of the excavated material and the increased difficulty of driving foundation piles, building forms and the placing of the concrete.

The most difficult feature of concrete pier and abutment construction, where considerable water is to be contended with, is the foundation work. Offhand, it might seem that winter would be an unfavorable time for doing work of this kind by reason of the hardships to which the men are subjected and the cost of protecting concrete against freezing. However, this is not generally the case, and the advantage of a more favorable stage of water usually offsets the increased expenses incurred by reason of low temperatures.

Crib walls, built of either concrete or wooden units, can be erected with no increased cost in the winter months. The concrete units are usually cast in a central plant and seasoned under favorable conditions as to temperature and humidity. They can also, if necessary, be cast out of doors on days of moderate temperature and effectively protected against freezing.

The ties and outside guard rails of steel bridges can be renewed without added expense during the winter season. The same statement holds also with respect to the renewal of timber ballasted decks, providing the ballast is of such a character that it will not be subject to freezing and thereby result in extra expense for its removal. On the other hand, the construction of a reinforced concrete ballasted deck is not advisable because the limited thickness of the floor, its exposed position and the difficulty of providing an adequate housing or other protection at reasonable expense militates against economical work. The fact that these floors require waterproofing, which must be put on in warm weather, is another argument against winter work on structures of that kind. The waterproofing is an important item.

Erecting Steel

Steel erection for all types of structures can be carried out just as well in the winter as in the summer. This is true of deck and through plate girders and also of truss spans erected by the cantilever method, and the equipment requirements are practically the same as in the summer months. In the case of through truss spans, arches and other complex structures, the cost of the work is dependent to a considerable extent on the falsework that must be provided, and falsework costs are dependent in large measure on the stage of water and the amount of drift that is being carried by the stream at the time that the falsework is in place. There are many cases where the stage of water is less and there is far less likelihood of high water or a heavy burden of drift during the winter months than in the spring or summer, although under some conditions the hazard of ice gorges will effectively offset the advantage of low water stage. It is more economical to drive falsework during periods of extreme low-water than during the normal or high-water stages encountered more frequently in the spring or summer.

The strengthening or repair of old steel structures can ordinarily be carried on equally well during the cold months. This applies particularly to such items as the replacing or adding of cover plates, frames, pedestals, end stiffeners and splices. Timber and steel highway bridges can usually be built at almost any time of the year, but concrete highway bridges entail some added expense because the thin columns, walls, beams and floor slabs require protection against freezing. Caisson or pile foundations constructed in connection with grade separation work, can be handled readily in the winter as the caisson work is all underground, while the footings constructed over foundation piles can be protected at almost no expense. Going to the other extreme, hand railings and other superstructure work constructed of either timber or steel are equally adapted to winter construction.

Taking the country as a whole, the temperature and weather conditions on most winter days are such as to impose no obstacle to economical work on many items of bridge construction and maintenance. However, the foremen of gangs employed through the winter should be instructed not to attempt any work with their gangs during storms or on very cold days except to meet emergencies.

Railway Bridge is Removable

Unique structure over gorge in Switzerland, where avalanches are prevalent, is dismantled to avoid winter storms and re-erected for summer service

MOVABLE railway bridges of one type or another, designed to permit navigation, are commonplace in this country, as well as elsewhere, but a movable bridge, designed to be taken apart and re-erected at regular intervals is a distinct novelty. Such a bridge is located on the meter-gage Furka-Oberalp railway of Switzerland, according to the *Railway Gazette,* London, England, and the details of the bridge contained herein, as well as the illustrations, are presented through the courtesy of that publication.

The bridge, known as the Steffenbach bridge, is located immediately east of the 2,138-ft. tunnel by means of which the Furka-Oberalp passes under the crest of

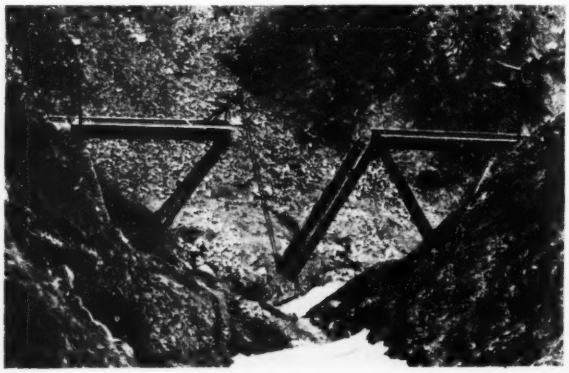


Fig. 1. Lowering the Center Span in the First Step of Dismantling the Bridge

the Furka pass. It is approximately 7,100 ft. above sea level and spans a deep gorge which, during the winter months, is swept by destructive avalanches. Having lost two bridges before the avalanches of two successive years, the present bridge was designed to be taken down and stowed away on both sides of the gorge during the winter and re-erected in the late spring. This particular type of bridge, which was made possible by the fact that much of the line over the mountain is closed to traffic during the winter because of light traffic, snow blockades and the unjustifiable expense of keeping it open, is shown during the different stages of being dismantled in the accompanying illustrations.

Three Spans

The bridge has three spans, two end spans and a center span, each of the end spans being supported at its outer end by means of a diagonal steel bent which has a hinged connection to the span and a pivoted support at the foot of the nearest abutment. The center span, on the other hand, is hinged to one of the end spans, and is held in its usual horizontal position at the opposite end by means of a full-splice bolted connection to the girders of the end span. An expansion joint is provided at one end of the bridge.

In dismantling the bridge, which is done by means of gallows frames and hoisting tackle provided as permanent fixtures at each end of the structure, the free end of the center span is first lowered until the span hangs in a vertical position about its pivoted end. This operation is shown in Fig. 1. The next operation is to retract the side spans, pulling them back on the roadbed approaches. This is done by raising the ends of the spans over the abutments by means of the gallows frames and tackle, and then drawing the spans back on to the approaches with ropes attached to the outer ends.

Bents Rest Against Abutments

During this operation, the hinged bents are pulled back through a sector of a circle, about their pivoted footings, until they lie close to and in the same planes as the battered faces of the abutments. During this operation at each end, the outer end of the span is raised and then lowered in describing an arc of a circle of radius equal to the length of the bent, and is at maxi-

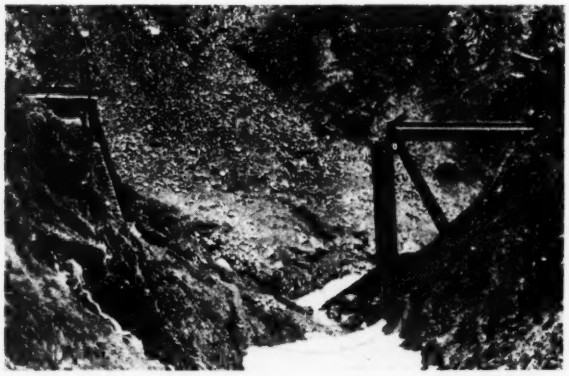


Fig. 2. The Left Side Span in the Clear—Right Side Span, with Center Span Suspended From It, About to be Moved Back

mum height when the bent is in a vertical position. In each case the bent is of such length that when pulled back with its supported spans against the abutment, the under side of the steelwork at the outer end of the span just clears the top of the track back of the abutment. On the side carrying the lowered hinged center span, the center span is drawn back with the diagonal bent and, in its final position, lies with the bent against the face of the abutment.

Figure 2 shows some of the features just described. The left side span has been pulled back clear of the gorge and the diagonal bent is shown lying close to the abutment. As shown in this illustration, the next step is to retract the span at the right.

Re-erecting the bridge is as simple as its dismantling, and is only a matter of pulling the side spans back into place over the gorge and then raising the center span. It is said that the bridge has solved the avalanche problem in the Steffenbach gorge completely.

WHAT'S THE ANSWER?

Have you a question you would like to have someone answer? Have you an answer to any of the questions listed here?

To Be Answered in January

1. What special precautions or methods, if any, should be employed in the inspection of switches in the winter, which are not necessary at other seasons?

2. What forms of failure occur in treated stringers, caps and sills? What are the evidences, if any, of approaching failure?

3. How much does it cost to replace a 39-ft., 100-lb. rail in track? Also one weighing 130 lb. to the yard? What considerations enter into this cost?

4. What are the advantages, if any, from the view point of insulation, of a dead-air space in the exterior walls of buildings?

5. Where tie plates are attached to the tie independent of the rail, what methods can be employed to line track during the winter when the roadbed is frozen?

6. What can be done to insure the uninterrupted operation of infrequently-used water stations, where the formation of ice in the tanks, spouts, cranes, etc. is unavoidable?

7. Is there any advantage in keeping the spikes driven down to a snug fit against the flange of the rail? If so, how can this be accomplished?

8. What means, if any, can be employed to make foundation excavation in frozen ground?

Rail Batter

When track is maintained to a uniform standard, on what part of the track does rail batter occur first? Does wide gage have any influence on its development ?

Never Occurs on Outside Rails of Curves

By J. MORGAN
Supervisor, Central of Georgia, Leeds, Ala.

On well-maintained tangent track rail batter occurs almost exclusively at the joints, but is much less with well-designed angle bars than with some other types of joints. Batter is most pronounced and can be observed first on the inner rail on curves. It will occur much sooner if the gage is wide than if it is kept to standard. If the low rail is kept vertical or has a slight inward cant, less batter will result and it will be slower in developing than if the rail is allowed to tip to a decided cant. A great deal of otherwise good rail is lost through improper treatment or failure of the maintenance forces to give it the proper care. With correct gage and cant, both batter and lateral flow of the metal can often be minimized almost to the vanishing point. Batter never occurs on the outside rail of curves.

Gage Should Be Snug

By Engineer Maintenance of Way

Before processes for reconditioning rail ends were developed, the life of the rail was generally determined by the rate of joint batter. This gave an excellent opportunity for observation as to the part of the track where rail batter occurs first and where it progresses most rapidly. In the north, hard battering occurs sooner than in the south, because the roadbed is frozen during several months of the year. The most severe cases of batter have been observed to occur in rock cuts, particularly where a minimum amount of ballast is used to cushion the solid-rock subgrade. In such places it is more pronounced if hardwood ties are used. At the other extreme, in the Canadian territory, rail batter seldom or never occurs over muskegs, presumably because of the cushioning effect of the yielding subgrade.

It has also been noted that where normal conditions of roadbed are found, batter occurs first on the low rail on curves and next on tangents. Batter rarely occurs on the high rail on curves. This may be explained in part by the fact that most roads cant the rail inward. Trackmen often cant the inner rail of curves by pre-adzing the ties for the tie plates. Where this practice is followed, the low rail is almost certain to batter more quickly than if the proper cant is given. This is attributed to the fact that too much canting provides only a narrow bearing on the outer corner of the head, thus overstressing the metal in this zone. The proper cant gives a wider bearing and avoids the concentrated loading which starts the batter at the rail ends.

I consider the fact that the high rail of curves batters little, if any, as definite proof that the full bearing of the contour of the wheel, on the side as well as on the top of the rail head, will greatly minimize, if not eliminate, the tendency of the rails to batter.

Where rails are changed over from one side of a curve to the other, the high rail in its new position does not batter as much as it did when it had its original full section. It will be observed, however, that what batter does occur is generally more along the gage side and top, with little or none on the new outside edge of this replaced rail. This fact further illustrates my belief that, if the bearing can be carried more nearly

on the gage side of the rail, less batter may be expected.

On the same principle, on tangents there will be less tendency to batter if the gage is maintained to the minimum than if it is allowed to get wide. Where snug gage is maintained, the contour of the wheel more nearly coincides with the contour of the rail head. This is still true even if the rail is canted a little too much, but applies especially where the proper amount of cant is provided.

Starts on Low Rails on Curves

By W. E. CONNELL
Roadmaster, Panhandle & Santa Fe, Pampa, Tex.

Except where there is considerable variation in the height of abutting rail ends, rail batter occurs first on the low rail on curves. This is particularly true on single track lines under grade conditions which cause a wide range of speeds. The metal is rolled out under the slow heavy drags and a bead or lip forms at the rail end, to be bent down or chipped under the faster trains, progressing quickly into battered joints.

In sags, despite heavy applications of anti-creepers, rail often becomes tight. Here light end flow occurs, lapping over the adjacent rail. The upward and downward reflex of the rail under the moving wheels then causes chipping and this again progresses into battered joints. Battered rail bunched in sags creates a loose roadbed which accelerates the rate of batter. After the low rail on curves, batter is, therefore, most likely to develop in tight rail in sags.

Wide gage on curves has a definite influence on rail batter on curves, the outward thrust causing the metal of the low rail to flow inward. Unless the gage is noticeably wide or quite irregular, it has little effect on joint batter on tangents.

Wide Gage Is a Factor

By W. H. SPARKS
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

This is an excellent subject for discussion but the question is difficult to answer within reasonable space limits. Assuming that the term "uniform standard" is intended to imply also a high standard, with heavy rail, tie plates, anti-creepers, rail joints properly bolted, ample ballast and adequate drainage, my observation is that rail batter will be in evidence first on those districts having the heaviest tonnage and fastest trains.

Assuming, however, that these traffic conditions are uniform for the district, we may expect to discover rail batter first at the points where heavy freight trains are pulling out of yards or up steep grades. In both cases, sand will be used, thus aggravating the tendency of the rail to flow. Rail batter, and particularly chipping, will probably begin to occur next at the foot of long or steep grades, where the rail has run tight. Lips of flowed metal form at the ends of the tight rails, to be bent down or broken off as the rail contracts under decreasing temperatures. If not broken or cut off, they will be sure to result in chipped ends as the rails expand and again make contact.

First of all, wide gage is not good for any track. As the gage is allowed to widen, transverse play of the wheels occurs. With the broad running surface which we have on 110-lb. and heavier rails, the rough outer part of the wheel tread comes to a bearing on the top of the rail, causing a marked increase in the amount of flow in the rail. As the outer rail on curves wears, the gage is widened and the outer part of the wheel tread bears on the ball of the low rail. This is why rail batter becomes so quickly in evidence on the low rail of curves, showing up on this rail in advance of that on tangents. Most battered rail and chipped ends result from too little expansion, but they may be considerably aggravated by allowing the bolts to become or remain loose.

Filtering Muddy Water

Where muddy water is being treated, should it be filtered before or after treatment ?

Depends on Softening Process

By E. M. GRIME
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

If the lime-soda ash method of softening is being used, then, unless the turbidity is excessive, the addition of these chemicals will usually create sufficient floc which, as it gradually settles in the treating process, will carry the mud down to the bottom of the tank. As a matter of fact, the lime-soda treatment can be considered in part as a filtering process, because the large flocs formed by the addition of the chemicals are depended on to drag down or filter out the smaller particles which otherwise would not settle completely in the time interval which is permitted in an ordinary water softening plant.

The quality of the turbidity constitutes a large factor in this matter. If the suspended matter consists of fairly coarse particles which, in any case, will settle out in two or three hours, we may say that almost any density ordinarily found may be handled successfully by the lime-soda process. If, on the other hand, it is a very finely divided material in which settlement is extremely slow, then a turbidity of 1,000 on the Jackson scale is the limit for successful treatment without previous sedimentation either by storage or aided by coagulation.

If the treatment is to be given by the zeolite process and the downflow method is used, it would be advisable that the turbidity of the raw water should not exceed 20 before it enters the softener. If the softener is of the upflow type, the raw water should be of practically zero turbidity in order to avoid the accumulation of silt in the bottom of the softener.

Depends on Method of Softening

By J. H. DAVIDSON
Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

If muddy water is to be softened by the zeolite method, it is essential that all or practically all suspended matter be removed before passing the water through the zeolite bed. If this is not done, the mud will fill the pores of the zeolite, thus preventing the water from coming into direct contact with the mineral, so that the capacity of the unit will be reduced. Mud which collects in the zeolite bed, also results in channeling, which again reduces the capacity of the unit. If this process is not checked in time, it will require the rebuilding of the entire zeolite bed.

Since most muddy waters contain very fine particles in suspension, which will pass through a rapid sand filter, it is necessary properly to prepare the water for filtration by means of chemical treatment. This treatment consists of adding a coagulant, such as aluminum sulphate, which forms a gelatinous precipitate that entraps the finely divided particles in suspension and forms a mat

on the filter bed that will successfully catch the finest particles.

If the water to be filtered is more than slightly turbid, it is good practice to provide for sedimentation with a settling period of from two to six hours. If a turbid water, which contains more than two or three grains per gallon of bicarbonate, is to be softened by the zeolite method, it is also good practice to remove this bicarbonate hardness with lime prior to filtration. This decreases the amount of sodium bicarbonate which would otherwise be contained in the softened water.

Most muddy waters that require softening can be clarified sufficiently and softened by the use of the lime-soda ash process with the addition of alum or sodium aluminate, provided the softening plant is properly designed and operated. If for any reason, it is desired to filter such water, filtration should follow the chemical treatment.

Filtration Is not Necessary

By J. A. RUSSELL
Engineer of Water Service, Pennsylvania, Philadelphia, Pa.

Assuming the intent of the question to be "when turbid water is softened, should it be filtered?" my opinion is that for general locomotive use, filtration is not necessary. A properly designed softening plant, operated with average intelligence at designed rates, should deliver water that is satisfactory for present-day practice. Such a plant should provide for the proper mixing of the chemicals and raw water as well as for an adequate retention period and low upward velocity. If the water is turbid, I would favor facilities for adding coagulent when and as required. With a plant so designed and operated under proper chemical control, we will generally find, I believe, that the initial cost for the additional building and equipment and the operating expenses for the filters, pumps, wash water, etc., can not be justified.

There seems to be some basis for the opinion that filtration after softening reduces slightly the hardness and the after-precipitation. My personal opinion is that filtration is not an economical method of securing this particular reduction in hardness. If it is obtained by filtration, we may find that some change in the design or the methods of operating the softener will reduce the hardness to a point where a further reduction through the filters will not be obtained. When after-precipitation becomes a problem, filters are held by some to be an aid in correcting the trouble. Recent practice indicates, however, that where the plant is properly designed and operated with due care, after-precipitation is reduced materially. It has been demonstrated repeatedly that, if with all of these precautions, including filtration, after precipitation persists, the real method of correction consists in fixing the water with CO_2.

It is also claimed in some quarters that filtering reduces the tendency of softened water to foam, particularly where the raw water is turbid and resists settlement. The statement that turbidity, of itself, creates a tendency to foam, other things being equal, is by no means proven, and unless the conditions in a particular treated-water district are peculiar, it would hardly seem necessary to filter the effluent of a properly operated modern softener in order to reduce the foaming tendency.

The time may come when we will have large tenders and different power, with fewer water stations, in which event it might be economical to provide filters and other refinements for water conditioning. Under present-day practices, it would seem to be more desirable to have three water-treating plants without filters than two such plants with filters. From the standpoint of first cost and operating expenses, this is about the ratio of the two methods.

On the assumption that the intent of the question was to bring out a discussion of whether filtration, if applied, should be given before or after softening, I would recommend that it be done after softening. I can imagine no reason for filtering any water before treatment, unless the nature of the turbidity is of such a character as to affect adversely the quality or nature of the softening chemicals or of the softening media. To filter before softening is, in general, likely to increase the first cost of the plant, while sacrificing practically all of the advantages which are advanced in favor of filtration.

Boxing the Ballast

What effect, if any, does "boxing" the ballast have on track conditions ?

Boxing Interferes with Drainage

By L. G. BYRD
Bridge and Building Supervisor, Missouri Pacific, Wynne, Ark.

From long experience in track maintenance, I am decidedly of the opinion that boxing the ballast, as usually practiced, is detrimental to any track. Boxing not only blocks the drainage at the lower level of the ballast, but it aids in the accumulation of dirt and vegetation in the ballast. It is a frequent direct cause of soft spots in the roadbed, which are certain to affect seriously the line and surface. While this effect is common on embankments where boxing has been done, it is particularly troublesome in cuts. If the condition is allowed to continue, it becomes increasingly difficult to cure. Again, the blocking of drainage which results from boxing the ballast becomes a serious matter in freezing weather, because wet or saturated ballast heaves badly as the penetration of the frost increases. Good track depends in large measure on good drainage, which cannot be obtained with dirty ballast or ballast that has been boxed by raising the shoulder of the subgrade with impervious material.

May Cause Soft Spots in Roadbed

By E. E. BOYER
Retired Roadmaster, Missouri Pacific, De Soto, Mo.

I assume you are using the term in its commonly accepted meaning of raising the shoulder of the roadbed above the foot of the ballast, and do not refer to boxing the tie by means of a ballast shoulder. Wherever the boxing of the ballast is allowed, it may create an obstruction to the drainage which causes water pockets and soft spots in the roadbed.

I have observed through many years of daily contact with track conditions, however, that the result of this practice depends on several factors. If the ballast is new, or clean if not new, and the material used in raising the shoulder of the roadbed is impervious, boxing is certain to cause soft spots. On the other hand, if the material used for boxing is porous, such as locomotive cinders, there may be no detrimental effect, although complete drainage may be somewhat delayed.

After several years of service, almost all types of ballast are well compacted at the base and are generally

quite impervious to drainage below a plane located only a few inches under the bottom of the ties, so that the penetration of water from above is limited to the depth of this plane. In this event, it is entirely safe and of decided benefit to maintenance to raise the shoulder of the roadbed to a point approximately level with this limit of penetration. It is beyond dispute that a high and wide subgrade supports the ballast shoulder and stabilizes the track, provided it does not interfere with free drainage, while it results in marked economy of ballast.

Depends Entirely on Kind of Ballast

By COL. F. G. JONAH
Chief Engineer, St. Louis-San Francisco, St. Louis, Mo.

This depends entirely upon the kind of ballast. If it is of a cementing nature, such as certain kinds of limestone and some pit-run gravels, boxing the ballast will lead to churning track, causing low joints and rough riding conditions. If, on the other hand, the ballast is of freely draining material, such as crushed trap rock, washed gravel, cinders or chatts, the boxing of the ballast will have no injurious effects on track; in fact, it will be beneficial, as it will hold the track in line. Any light or well-drained ballast will give better track conditions when there is a shoulder of ballast at the ends of the ties.

Short I-Beam Spans

Where short I-beam spans become too light for the loading, is it more economical to strengthen or replace them? If the former, how should this be done? If the latter, what is the most satisfactory method ?

Heavy Sections Facilitate Renewal

By P. G. LANG, JR.
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

To begin with, the meaning of short I-beam spans must be determined. Within recent years, large I-beams, or more properly girder beams, have been developed and are in general use. As a result of the larger-section beams which are thus available, I-beam spans have increased in length. Previously 30 ft. was about the limit of such spans for railroad loading. Since the introduction of the newer sections this has been increased to 45 ft. or more.

When speaking of spans too light for present-day loading, it can be assumed that the older sections and, therefore, shorter spans are under consideration. It is also assumed that open timber floors are meant. Under these conditions, such spans are generally composed of two or more I-beams under each rail. Good design for such a span requires that the load transmitted through the rail be distributed uniformly to the several I-beams. This distribution must be made through the timber ties, primarily by means of bending. To reduce the size of the ties, it is essential that, so far as practicable, the center line of the rail shall be over the center line of each group of I-beams.

If this is not done, if proper consideration is not given to distributing the load through the ties and the matter of the proper depth of ties is neglected, an unequal distribution of the load to the several I-beams will result. Since the gage of the track is fixed, the number of I-beams that can be placed under a rail is limited. For this reason, it is seldom that more than four I-beams to a rail, or eight for a track, can be placed.

When considering an increase in the carrying capacity of such spans, it is generally economical to add a third or fourth I-beam per rail. In these cases the beams should be shifted so that the center line of each group coincides approximately with each rail, at the same time substituting diaphragms or yokes for the bracing.

If the span is already composed of four beams to the rail, it would seem that the most economical solution would be to replace the present span with a new one. Heavier beams of the same depth and length may be employed, or, since most bridges of this type are located at low points in the grade line, beams of deeper section may be employed, at the same time improving grade conditions. In general, the actual removal and replacement of I-beam spans can be accomplished easily between trains, thus avoiding interruption or delay to traffic. The entire span can be handled as a unit by means of a locomotive crane or bridge derrick.

Favors Making Replacement

By O. F. DALSTROM
Engineer of Bridges, Chicago & North Western, Chicago

Short I-beam spans should be replaced with stronger spans when they become too light for the loading. Many factors combine to make this statement true of all such spans up to 25 ft., while it applies in many cases to longer spans.

Shop costs are low, since fabrication requires little more than the assembling of the beams into sets, with diaphragms riveted to the webs; the providing of short laterals and their connections; and the fitting of the bearings to the ends. The units that make up the span are easily handled in even the smallest shop. Furthermore, it is not necessary that the shop work be of the highest grade, since it is only required that all of the beams be assembled with their top flanges in one plane to receive the ties, and that the ends are fitted to the bearings.

Erection costs are also low. Falsework is never necessary for removing the span or for erecting a new one. A derrick with a 40 or 45-ft. boom will handle short I-beam spans from the track in which it is to be placed or from an adjacent one. No riveting outfit is required in the field, since all field connections can be made with bolts. There need be no interruption to traffic, because the old span can be removed, the new one placed and the track restored in less than an hour. The work may not be completed in that time, but other details can be finished under traffic.

I-beam spans can be loaded considerably beyond their normal rating with little danger of failure. The section of the beams is determined by the section modulus that is required at the point of maximum bending moment. With this requirement fulfilled, the span will have excess strength throughout, except at the critical section. Shearing strength must be considered in the design, but the section determined by the bending moment always gives excess resistance to shear. A few shop-riveted diaphragms between the beams and a few short lateral angles hold the top flanges in alinement under compressive stresses.

Since there are no weak details to give way, an I-beam span can be kept in service under an overload with less hazard than any other type of span. Stated in another way, it can be kept in service longer under a given overload, than any other type of span.

Unless there has been serious deterioration, the released spans can be used elsewhere on lines of light traffic or in industry tracks. Spans longer than 18 ft. are convenient for framework on construction. Such spans,

when encased in concrete make the strongest kind of slabs for ballasted bridges. By cutting down with the acetylene torch and changing a few end details, they can be adapted for use as shorter spans.

The foregoing comments will stand out more clearly if we consider briefly a few of the advantages gained by reinforcing some other type, say a through plate-girder span. When a plate girder is loaded much beyond its designed loading, weakness is manifested (1) in the connections between the stringers and floor beams; (2) in the connections of the floor beams to the girders; (3) in the top flanges of built-up stringers, this being usually where the outstanding leg of the flange angle is wide and thin; (4) at the ends of the girders over bearings, but this is not common; and (5) occasionally in the laterals of the older types, which have pin connections.

It will be noted that the points of reinforcement that have been enumerated constitute but a small part of the entire span. By giving adequate strength to these outstanding details, it can be brought to a higher rating at a cost that is usually small as compared with the cost of replacement. It will also be noted that the details which commonly require reinforcement in a through plate-girder are not present in I-beam spans.

Before dismissing this subject, a special type of I-beam span that has been reinforced to advantage might be mentioned. This is a type used in coaling stations and consists of one I-beam under each rail which is laid directly on the top flange of the beam. We have a large number of these spans, many of them built before the modern large-capacity coal cars were developed. Under present loadings the top flanges deflect laterally, spreading the rails, occasionally causing derailments. This has been corrected, however, by substituting for the tie rods between the beams, rigid diaphragms as deep as can be fitted between the flanges of the beams, spaced at 6 to 8-ft. intervals. This arrangement holds the beams in true alinement.

In Most Cases Renewal Is Warranted

By District Engineer

On one section of our road, about 200 miles long, we had, up to 20 years ago, an average of about one short open-deck span to the mile. They consisted of rail-top culverts, I-beam spans and deck-plate girders. Practically all of them became too light for the loading, so that it became necessary to strengthen or replace them. In all but a few cases the substructures were of stone masonry in an excellent state of preservation, which, if properly maintained, were good for many more years of service.

A complete survey was made of these structures and a definite policy for handling the situation was outlined. Changes in drainage conditions made it possible to install concrete pipe and fill some of these openings. In a few cases where the life of the masonry was questionable, and a larger waterway was needed than could be provided with pipe, flat-top concrete culverts were constructed to clear the existing abutments and these openings were also filled. The remainder of the structures were divided into two groups, 22 ft. being selected as the dividing line. Above this, the girders were replaced or strengthened as was most economical, with due regard for the age and condition of the metal. The maximum I-beam span was 20 ft. For some of those that were 22 ft. or less, new I-beams or girders were designed for one track, the spans on the other track being strengthened by adding the spans thus released.

In selecting the line of demarcation between the two groups, 22 ft. was chosen because it was considered to be the maximum economical span for reinforced-concrete flat slabs. The remainder of the spans in question were replaced by precast flat slabs. In some instances the first cost of this type of construction was somewhat greater than would have been necessary if new spans had been installed on one track and the released spans doubled up with those on the other track. The advantages of having an unbroken line of ballast and the elimination of maintenance were considered to be sufficient justification to warrant the higher cost, however.

Use of Mauls and Sledges

What precautions should be observed in the use of mauls and sledges to avoid injury to trackmen?

Use Only for Purpose for which Designed

By W. E. CONNELL

Roadmaster, Panhandle & Santa Fe, Pampa, Tex.

Most important of all rules is the requirement that these, as well as other tools, be used only for the purposes for which they were designed. While several items might be selected as next in importance, I am inclined to emphasize the requirement that the handles be straight, of uniformly good material, properly fitted and wedged. Faces should be true and all burrs and chips should be ground off so that the edges are clean and smooth. Neither of these tools should ever be used to strike across the rail, since this invariably lends itself to a glancing blow and is extremely hazardous. None but men experienced in the use of these tools should ever be permitted to use them, particularly where the working space is close.

Sledges used in striking chisels should be full-faced, and the chisel head should be protected with a safety cap, which can be made of old air hose or similar material. The man holding the chisel should wear goggles. Spike mauls should never be used to strike chisels. A 12-lb. sledge is sufficiently heavy to perform such ordinary maintenance tasks as cutting rails, cutting bolts or nuts, driving boat spikes, etc. A heavier sledge destroys the chisel and adds to the probability of injury. Two such hard-faced tools as mauls and sledges should never be struck together.

Handles Should Always Be True

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

These two tools form an important part of the equipment of section and extra gangs. Few tools are used more frequently or are capable of causing more painful accidents when used without observing the proper precautions. For this reason, foremen and supervisors should know that every man who uses them is observing the rules of safety that long experience has shown to be necessary.

In the first place these tools should be handled only by men who know how to use them. New men should be educated to their use before they are allowed to handle them freely. An experienced employee will observe whether the handle is straight and sound. Many handles that are not true are sold to the railways and these should be discarded at once. A maul or a sledge that is out of line because of a warped handle is a dangerous tool, because it is quite likely to cause injury to the man using it or to others near him.

Wedges designed to hold the handle in the eye should be of iron. Wooden wedges dry out or compress, so that they may become loose and fall out at a critical moment, allowing the head to fly off of the handle.

Striking faces should be true and without burrs or mashed spots, particularly around the edges. Too much care cannot be exercised in this respect. No man should be allowed to use either tool for drilling or cutting without having first put on goggles. Many an eye has been lost through failure to do this. Like all other section tools, neither of these implements should be used for any other purpose than that for which it was designed. The spike maul is intended to be used for driving spikes and should be used for this purpose only. Sledges should be used for striking chisels, driving boat spikes, spacing ties and similar work requiring a heavy hammer blow.

Inspection and Supervision Are Important

By L. G. BYRD
Bridge and Building Supervisor, Missouri Pacific, Wynne, Ark.

Safety is the most important consideration in all maintenance work, so that accident prevention in the use of tools should be backed up by close supervision and careful regular inspection by foremen and other employees who are responsible for their care and use. Since mauls and sledges are used so frequently by both track and bridge gangs, they should be inspected before they are put into service and frequently while they are in service. The foreman should know their condition and be sure that the head is well secured to the handle. If the face shows signs of open cracks, slivers or burrs, the tool should be removed from service.

It is just as necessary to instruct employees how to use such tools, and to hit every blow square with the full bearing on the object struck, whether it be chisel, spike, bolt or tie. The maul should be raised vertically and not swung through an arc, particularly if other workmen are close at hand. Goggles should always be worn while striking chisels or heavy metal objects, to avoid the possibility of injury to the eyes by steel slivers or particles of rust.

Every Tool Has a Purpose of Its Own

By C. L. DEMING
Roadmaster's Clerk, Chicago, St. Paul, Minneapolis & Omaha, Sioux Falls, S. D.

Every tool is designed for a given purpose. While it may do for other work, there is always an element of danger when it is so employed. A spike maul is made of hardened steel to impact against the softer metal of the spike. When used in this service, it seldom chips or splinters. If it is used, however, to strike a rail or a chisel, there is great danger of splinters flying and causing personal injuries. In fact, I recall a case where a section laborer lost his life through injuries received from this very cause.

Spike mauls should be used for no other purpose than for driving spikes. For all other work, a 10-lb. or 12-lb. sledge should be employed. Track chisels should be protected by means of a piece of air or steam hose about 3 in. or 4 in. wide, placed over the head. Seldom are two track chisels found that are tempered the same, and this method of protection is an excellent preventive of flying slivers.

When cutting rails, both the man holding the chisel and the man using the sledge should be required to wear goggles for the protection of their eyes. With proper educational effort on the part of the foreman, and constant supervision to insure that the mauls and sledges are used only for the purposes for which they were designed, there should be few, if any, accidents resulting from the use of these tools.

Many Precautions Are Necessary

By ROBERT WHITE
Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

To name and discuss all of the precautions that should be observed in the use of these much-used tools would require more space than is available. These are simple tools that can be handled safely with the most elementary precautions, yet some one is constantly getting hurt with them. In the first place, each has definite uses and should never be employed for any other purpose. The spike maul is designed for driving spikes and applying or removing some types of anti-creepers. Two men should never be allowed to drive on the same spike,

Left—What's Wrong with This Picture?
Right—The Correct Way to Strike a Chisel

nor should one be permitted to hit a spike as fast as he can. Never reach over the rail to drive a spike on the other side. Do not use a maul or sledge with a warped or broken handle, or one that does not balance.

Battered, chipped or splintered mauls and sledges are a menace. Do not use them. They should either be ground to a smooth true face or sent to the stores department for repair. When one is inclined to use tools with these defects, he should bear in mind that there are no spare parts for trackmen, as there are for machines. A sledge is far safer than a maul for striking chisels. This is also true for boat spikes and drift bolts. Because it is never certain that even the best of tools will not sliver or chip while in use, it is quite necessary that goggles be worn when striking chisels or any other hard steel.

Keep Tools in Good Condition

By C. E. SANDOVAL
Section Foreman, Southern Pacific, Tubac, Ariz.

Sledges and mauls should be kept in as nearly perfect condition as is practicable. A battered, checked, split or slivered maul or sledge is dangerous and should be discarded at once. Spike mauls should be used for no other purpose than driving spikes. For other work requiring heavy hammer blows, such as cutting rail, driving boat spikes, etc., a 12-lb. sledge is most satisfactory. Foremen should be equally careful to know that chisels are in comparable condition.

One important essential of both of these tools is straight handles made of straight-grained wood. Even the most expert cannot handle them safely if they are out of true with respect to the handle. The practice of striking the heel of the clawbar to force it under the spike is one that should be strictly prohibited. Flying

chips or slivers of steel cause painful and often serious injuries, particularly if they hit around the face or eyes. For this reason, the wearing of goggles should be mandatory when striking chisels or other heavy metal objects. If these precautions are taken, the personal-injury accident rate should be low.

Handles Should Be Straight and Sound

By R. ROSSI

Yard Foreman, Alton, Chicago

To avoid injury to trackmen in the use of mauls and sledges requires the most alert supervision on the part of the foreman. Men are inclined not to think, but to grab the handiest tool for the work they are doing. This should not be permitted, since each tool has its own use and no substitute is as satisfactory, but on the contrary, is usually less safe.

Mauls and sledges should be examined daily to insure that no defective tools will be used. The handles should be straight, sound and properly secured in the eye. A piece of rubber hose should be placed on the striking face, but this does not eliminate the necessity for always wearing goggles when striking a chisel or other tempered steel.

Before swinging a maul or sledge, the trackman should observe that other men are not near enough to be hit. The proper position when driving spikes or striking a chisel is of much importance from the standpoint of safety. Never drive a spike on the other side of a rail. The man holding the chisel should always place himself at the side of the man using the sledge, so that the handle of the chisel is at right angles to the direction the sledge man is facing. These are simple precautions, but failure to observe them has caused innumerable personal injuries and, in some cases, death.

Cutting of Sand Pipes

What methods, if any, can be employed to prevent or minimize the cutting of pipes leading from the sand drier to the storage at locomotive sanding stations when compressed air is employed to elevate the sand ?

Form a Pocket at all Turns

By L. L. TALLYN

Division Engineer, Delaware, Lackawanna & Western, Scranton, Pa.

My experience indicates that the best method for discharging sand from the drier to the storage at locomotive sanding stations is to arrange the equipment so that the sand will run by gravity from the drier to the discharge tank. The discharge pipe from this tank to the storage should be laid straight, if possible. If turns must be made, a tee should be used instead of an elbow. A short nipple and pipe cap should be screwed into the end of the tee, the turn being made through the stem of the tee, thus providing a pocket for the accumulation of sand. At the discharge end of the pipe, I find it a good practice to weld a larger diameter pipe about 2 ft. long over the discharge line, having the ends of the two pipes even. Then screw a tee and nipple on the larger pipe in the same manner as in making other turns, but with the stem of the tee turned down. For a 2-in. discharge line, the sleeve pipe should be 3 in. If a welded discharge line is being installed, the straight run should be made a little longer at the turns, according to the size of the pipe, to form a pocket in the same manner as with the screwed tee.

The discharge pipe should be connected to the sand tank under the drier at the best angle to suit conditions, and extend to about the center of the tank and 3 in. above the bottom. The air connection to the sand discharge tank should be made at the top of the tank and should not be extended into the tank.

Wear Can Only Be Minimized

By D. E. WHITE

Contracting Engineer, Roberts and Schaefer Company, Chicago

Many years ago we experimented with the application of pipe having long-radius bends for elevating sand. This was done on the theory that the rapid wear on the pipe would be avoided if we could spread out the abrasion which occurs when sand is blown under pressure, instead of concentrating it at one point, as is done when a sharp turn is made. It developed, however, that the long-radius bends aggravated rather than improved the situation, since there was a continuous scouring effect over the full length of the bend. As the steel was so much softer than the sand, it wore rapidly, while the cost of the bends was high, as compared with straight pipe.

For a number of years, therefore, we used straight pipe with special 45 deg. and 90 deg. bends, made of hardened steel, with extra metal on the side upon which the sand impinged. This was successful only in proportion to the hardness of the metal and to the extra thickness which was provided. Both of these features added to the cost of the bends, making them expensive to renew. It should be borne in mind that these attempts to control wear in the pipe were made in connection with sand-elevating installations in which air was used under pressures ranging from 80 to 100 lb. These high pressures and the resulting velocity of the sand gave the effect of a sand blast of great abrasive power.

It soon became apparent that the only substance hard enough to withstand the effect of the sand is sand, and this led directly to the use of sand pockets at the turns in the line. These pockets are formed by the introduction of either wye or tee fittings that are plugged on the leg which forms a prolongation of the straight-run of the elevating pipe. This leaves one leg and the stem of the fitting open, and to the latter is attached the elevating line which leads to the storage. The plugged end of the fitting provides a pocket which is filled as soon as the elevating process is started, and this dry sand acts as a cushion against the moving sand, thereby avoiding direct action on the pipe at the point where it changes direction.

While this does not completely eliminate wear on the sand elevating pipes, it does afford the most satisfactory arrangement yet devised to keep down excessive wear, assuming that care is exercised in the first place to get a pipe line well laid out as to direction and the avoidance of unnecessary bends.

Under certain conditions, sand can be elevated with much lower pressures than are ordinarily used. We have demonstrated that for lifts not in excess of 35 ft., air pressures of 15 to 20 lb. are sufficient, and that the wear on the elevating pipes is correspondingly reduced. In most installations the air is delivered directly to the top of the elevating drum with, sometimes, a small booster pipe at the bottom. Where the main pressure is on the top of the sand in the drum, it is necessary to use high pressure to force the sand into the elevating pipe which is at the bottom of the drum. By applying the air blast at the bottom of the elevating pipe, properly arranged

with respect to the location of this pipe, dry sand can be lifted to the overhead storage with an air pressure of about 15 lb. from an open-top tub, thereby eliminating the necessity for riveted steel drums designed for high working pressures. This scheme not only avoids the expense of the drum, but it also results in a marked reduction in the wear of the elevating pipes. We have not as yet attempted to lift sand higher than 35 ft. by this method.

In many of our recent sanding plants, which are ordinarily built in conjunction with locomotive coaling stations, the wet-sand storage, the drying room and the dry-sand compartment are built beneath the dumping point of the coal bucket, in which the wet sand is also elevated. The plant is so designed that the wet sand feeds by gravity to the drier and thence to the dry-sand storage, which is directly underneath. The only limitation on this type of plant is that of wet-sand storage, and this is dependent on the amount of head room available. Where a winter's supply of green sand must be provided, ground storage is the only recourse, in which case either a separate elevator must be provided for the wet sand or the dry sand must be elevated by compressed air. In the latter case we know of no more satisfactory method of minimizing the cutting of the discharge pipes than through the use of plugged fittings and of compressed air applied at pressures as low as practicable.

Broken-End Ties

What causes ties to break at the ends? What can be done to prevent this ?

Improper Tamping Is Cause

By R. M. CUNNINGHAM
Roadmaster, Erie, Hornell, N. Y.

This question can be answered in two words—improper tamping. The trouble is usually experienced on track where the tamping is done just outside of the base of rail and trains are allowed to proceed over it before any tamping is done under or inside of the rail. To prevent tie breakage of this character, it is necessary to tamp the ties outside of the rail, under the rail and for not less than 12 in. inside of the rail.

It is my observation that the most serious breakage occurs on the low side of curves, caused principally by spot surfacing on the high side. If the superelevation is increased in this or any other manner, the low rail is raised off of its bearing. This forces the lower end of the tie to carry the entire load. If the low side is not raised, all ties should be retamped under the rail and for a distance of 12 in. inside. Special care should be taken to tamp all ties from both sides.

Several Causes Contribute

By E. P. SAFFORD
Supervisor of Track, New York Central, Silver Creek, N. Y.

Several causes contribute to this condition, among which are: Brash or dead timber; insufficient support for the rail, caused by too few ties or by undersized ties; neglect of tie renewals, so that the average condition of the timber is not kept up to the proper level.

While some or all of these items may be contributing causes, the principal reason is improper tamping. Tamping the ends of a tie hard, while tamping less thoroughly under the rail, places all of the load on the ends of the tie, making it a beam supported at the end. The weaker ties then give way under the strain. Some foremen, when spot surfacing, tamp the jack tie directly under the end, doing this from the end. After the jack is removed, the tamping under the rail is not done so that the tie is raised free of the end tamping. This is poor practice, since a tie should be tamped under the rail and gradually eased off toward the end. When the tamping is done in this manner, broken-end ties will not occur.

Method of Tamping Is at Fault

By C. E. SANDOVAL
Section Foreman, Southern Pacific, Tubac, Ariz.

While improper tamping is generally the fundamental reason why ties break at the ends, the condition of the ties and the character of the ballast are often important factors. Every tie should be tamped thoroughly under the rail and to a uniform bearing on both sides. The standard to which this is done will always depend on the alertness of the foreman and the quality of the supervision he gives his work. I have seen instances where men were allowed to drive large stones under the tie for the purpose of lifting it. This will frequently result in broken ties, particularly if the stones are placed at or near the ends.

Broken ties often occur at joints, frequently as a result of loose bolts. It is sometimes difficult to maintain a uniform bearing on ties where the ballast is poor, so that even the most careful attention will not entirely eliminate the trouble, particularly if the ballast contains many large stones.

Tamps Thoroughly Both Sides of the Rail

By R. ROSSI
Yard Foreman, Alton, Chicago

While there are several minor causes for this trouble, such as spike cutting, cross-grained timber and excessive wear under the rail, relatively few ties are broken because of them. The primary and most common cause is solid tamping at the ends and less thorough or no tamping under the inside of the rail. Some foremen tamp the ends of the ties first when raising track and then go back and finish under and inside of the rail. If one or more trains pass over the track before the inside tamping is done, the ballast at the ends is well compacted and it is difficult, if not impossible, to match the solidity of this ballast with the later tamping.

To prevent this condition, no more track should be raised than can be tamped inside and out between trains, and the inside tamping should be done at the same time as that outside of the rail. When working in stone or washed-gravel ballast, mechanical tampers should always be used to obtain the best results, because hand tamping, no matter how carefully done, cannot match the uniformity of power tampers. This is also true to only a slightly less degree of other types of ballast.

Ties Break for Several Reasons

By W. E. CONNELL
Roadmaster, Panhandle & Santa Fe, Pampa, Tex.

Ties break at the ends for several reasons, one of which is improper tamping at the time of insertion or later during routine maintenance. For proper support and to enable it to take its load properly from the adjacent tie, it should be well tamped under the rail, which is normally the point of severest stress. At this point the timber is much weakened by spike penetration and,

frequently, by abrasion of the rail seat or tie plate. Respiking still further weakens the timber at the critical point, even though tie plugs are used.

No better preventive of broken ties can be devised than to provide a uniform bearing for all ties at the time of insertion and then to maintain it constantly during the life of the ties. The ties should be of sufficient size, however, so that the driving of the spikes will not seriously affect their strength.

Bridge Supervisor's Record

What form of record should a bridge and building supervisor keep of the condition of the bridges and culverts on his territory ?

Should Be in Book Form

By J. E. BERNHARDT

Bridge Engineer, Chicago & Eastern Illinois, Chicago

A bridge and building supervisor should prepare every year a set of well-bound note books in which is entered a notation showing the number and location of the structure, accompanied by a brief description. The structures should be entered in consecutive order, based on the route he takes in making his periodic inspections.

Sufficient space should be left between each entry for proper notation of the conditions that are found at the time of these inspections. He should be required to make very full and complete notes of all defects that are discovered, since they will be of material assistance in determining the changes that are occurring, such as cracks in masonry, shifting of masonry and similar items, during the intervals between inspections.

If, in his opinion, repairs are necessary, he should note what work is to be done and the material that will be needed. Where the repairs are completed he should make an entry to this effect, giving the date. A new set of books should be made up every year and the old ones should be filed for reference.

Record Should Be Complete

By L. G. BYRD

Bridge and Building Supervisor, Missouri Pacific, Wynne, Ark.

This is an important matter which should receive the serious attention of every bridge and building supervisor. Unless his records are complete, accurate and readily available, he will be unable to program his work properly or conduct it efficiently. For timber trestles, his record should include the number, location, date of construction and of renewal, length and height of all structures, together with the length of the individual spans, the penetration of the piling in each bent, the kind of material and the date and character of the latest repairs. A similar record as to detail should be kept for steel and concrete bridges and for culverts, and of all buildings and other structures of which he has charge.

The most important feature of the record should be the inclusion of the notes taken during the annual inspection. These notes should cover every detail of every structure, the list of such items being too long to give in full here, and should be particularly complete with respect to such defects as are discovered. This record should be in book form and should be written up on the ground at the time the structures are examined. Each item of repairs should be listed, including the size, amount and kind of material required, together with the estimated cost of both material and labor. Later, typewritten copies should be made and furnished to each of the gang foremen for the territory he covers.

It is of urgent importance that a supervisor know, or have information immediately available, showing the condition of every member of every structure, to enable him to get the full life service and know that the structure is safe. He should, therefore, always have this record with him. If he fails to keep an accurate record of costs, he is unable to know whether his work is being done economically. To increase further the efficiency and economy of his operations, he should also have a current record of all unapplied material on his territory and its location.

Prefers to Use Card Files

By G. M. JOHNSON

Bridge and Building Supervisor, Wabash, Peru, Ind.

For ready reference, a bridge supervisor should have two card files, one for open-space bridges and the other for culverts and other closed-top structures. The first card in the bridge file should include 10 items covering a detailed description of the structure, its purpose, the drainage area, if a waterway, and the date of construction. The first cards for the culverts should contain equally detailed information with respect to these structures.

A second card, intended for current use, should contain all necessary information about the condition of the structure, and special reference should be made to all defects and to the repairs that are immediately necessary, as well as to those that can be deferred. The date, character and cost of all repairs that have been made should be recorded. Another item should be included to cover recommended changes in any structure. The current record for culverts should be made in similar detail, but more space will be required for information about drainage and channel conditions.

Boston & Maine Organizes

(Continued from page 960)

down in organization or failure to keep up with a storm can be remedied quickly by system aid or instructions.

Important lines, interlockings, yards, stations, etc., are always given preferred attention during storms. In fact, as a matter of economy, some of the less important lines, and the stations on these lines are only opened for scheduled passenger and freight trains. On these light traffic lines, night snow fighting is avoided where at all possible and it is considered sufficient if these lines are cleared ahead of regular passenger trains and are made ready for freight switching only as required. Arrangements to this end have been worked out with the operating department, and it is said that substantial savings are effected over trying to keep these lines fully opened at all times.

Securing extra labor presents no serious problem on the Boston & Maine for several reasons. In the first place, with practically every available employee on the road, in the office and shops as well as on the line, subject to storm duty of some character, and with the large layout of snow handling and melting equipment provided, there is little need for extra labor, except in the case of most severe storms. Furthermore, with the labor market plentiful, as it has been for the last few years, such men as may be needed are readily available for work on short notice.

NEWS OF THE MONTH

Hadley New Head of Train Control Committee, A. R. A.

E. A. Hadley, chief engineer of the Missouri Pacific, has been appointed chairman of the Automatic Train Control committee of the American Railway Association, succeeding W. P. Wiltsee, chief engineer of the Norfolk & Western.

Fewer Accidents at Grade Crossings

Accidents at highway grade crossings in the first six months of this year totaled 2,114, a reduction of 221 as compared with the same period of last year, and the smallest number to be reported in the first six months of any of the past eight years. The number of fatalities caused by these accidents totaled 921, a reduction of 41 as compared with the same period of 1930. This also was below any corresponding period since 1923, in which year the total was the same. The number of persons injured in the first half of this year aggregated 2,403, a reduction of 282 as compared with the first six months of last year, and the smallest number for any corresponding period since 1922.

Eastern Four-System Plan Submitted to Interstate Commerce Commission

A complete consolidation plan for the grouping of the eastern railroads, except those in New England, into four systems was submitted to the Interstate Commerce Commission on October 3, with an application for modification of the commission's consolidation plan of December 9, 1929, which provided for five eastern systems. A general agreement on the four-system plan was announced last January but a number of controversial points have delayed its presentation to the I. C. C. Even yet some of these remain unsettled but they have been set aside for the present and will be taken up again in the future. The four systems will be grouped around the Baltimore & Ohio, the Chesapeake & Ohio-Nickel Plate, the Pennsylvania and the New York Central. According to the plan, the mileage of the four systems will be as follows: Pennsylvania, 16,500; New York Central, 13,000; Chesapeake & Ohio-Nickel Plate, 12,500; and Baltimore & Ohio, 11,000. If the commission accepts the principle that the public interest will best be served by combining the eastern roads into four systems instead of the five proposed in this plan, further proceedings will be necessary on each application for acquisition or consolidation of the various railroads.

Truck-Body Rates to Meet Truck Competition

Another step in the railroads' efforts to meet highway competition has been taken by five eastern roads which have filed with the Interstate Commerce Commission tariffs proposing flat rates for the transportation of truck bodies, loaded or empty. The truck bodies are to be furnished by shippers and equipped with hooks by which they may be lifted bebetween freight cars and trucks or trailers by cranes. The tariffs have been filed by the Baltimore & Ohio, the Central of New Jersey, the Delaware, Lackawanna & Western, the Pennsylvania and the Richmond, Fredericksburg & Potomac and are to become effective on or about November 5 for an experimental period of one year. Flat rates are proposed for three sizes of truck bodies and the rates apply regardless of the contents, except that the tariff includes lists of commodities that will not be accepted for such transportation, such as perishables, explosives and especially fragile articles. All the tariffs include rules and notes stating that the railroads' responsibility does not begin until the truck body is in course of transfer by crane from truck or trailer to car and ends when the body is delivered to truck or trailer.

More Railroad Legislation to be Proposed

The National Industrial Traffic League, in a letter to various members of congressional committees dealing with interstate commerce, has requested that revisions of the Transportation Act and other railway regulatory legislation be undertaken at the coming session of Congress. The two principal items of legislation asked are the repeal of the re-capture provisions of the law and the adoption of a flexible rate-making rule in place of Section 15a. As now constituted the first of these requires that if any railroad in any year earns more than six per cent on its property investment, it must pay one-half of the excess to the government. The second stipulates that rates must be so regulated as to allow the railroads to earn a fixed annual percentage on their property investment. The letter pointed out that "the shippers believe that the re-capture provisions have resulted in building up enormous liabilities on the part of the principal railroads of this country, which hang like a pall over them during these depressed times." The question of motor transport is also taken up in the letter which says that "some federal regulations of automobile bus traffic in interstate commerce should be speedily adopted."

Ton-Miles by Rail Thirty Times Those by Truck

All the freight cars in the United States have a carrying capacity 20 times that of all the motor trucks, and the indications are that the ton-mile output of the freight cars in recent periods has aggregated more than 30 times that of the trucks, according to a bulletin recently issued by the Cleveland Trust Company. The bulletin also revealed that most of the motor trucks are relatively light vehicles used in city deliveries and on farms, and less than 10 per cent of them are common carrier trucks. "It is clearly true," continued the bulletin, "that there is no present prospect or possibility of the motor trucks supplanting the railroads in carrying the bulk of the freight that must be transported. Nearly three-fourths of all the freight moved consists of such commodities as coal, ore, lumber and agricultural products which must be carried in bulk for long hauls and at low transportation costs. For such service, we must continue to rely on the railroads. The present difficulties of the railroads are not due primarily to truck competition, but to two other causes. The first is that the production of freight has fallen almost to unbelievably low levels, and the second is that the freight rates allowed the roads are two low."

Earnings of Class I Carriers Continue Decline

The net railway operating income of the Class I railroads of the United States in August was $55,858,734, which was at the annual rate of return of 1.90 per cent on their property investment, as compared with 3.33 per cent in August, 1930, according to reports compiled by the Bureau of Railway Economics. For

the first eight months of 1931, these roads had a net railway operating income of $350,943,778, or 2.14 per cent, as compared with a net income of $556,466,261, or 3.45 per cent in the first eight months of 1930. Operating revenues for the eight months totaled $2,929,108,894, as compared with $3,615,795,956 for the same period in 1930, or a decrease of 19 per cent. Operating expenses for the first eight months of this year decreased 17.1 per cent under the same period of 1930. Taxes for the eight months totaled $221,626,833, as against $243,817,704 for the same period last year, a decrease of 9.1 per cent.

Dunn and Lee Head Simmons-Boardman Company

On October 7, Samuel O. Dunn, vice-president of the Simmons-Boardman Publishing Company and editor-in-chief of the magazines published by that company, including *Railway Engineering and Maintenance* and the Railway Age, was elected chairman of the board; and Henry Lee, vice-president in charge of the business department, was elected president. Their election followed the death, on September 30, of Colonel E. A. Simmons, who had been president of this company.

Colonel Simmons had been identified with the Simmons-Boardman Company and its predecessor for 42 years, while the association of Mr. Lee and Mr. Dunn dates from 1905 and 1907, respectively. All three participated in a major degree, under the leadership of Colonel Simmons, in the development of the company and its affiliates to their present position as publishers of nine leading papers, including five in the railway field.

In 1911, at the suggestion of Mr. Dunn, then editor of the Railway Age Gazette, Colonel Simmons authorized the creation of a special department in that publication to be known as the Maintenance of Way Section, and to be published as a part of the third issue of each month. The success attending this innovation was such that, beginning with the issue of June, 1916, it was made a separate monthly paper, the *Railway Maintenance Engineer*, the name of which was changed in 1923 to *Railway Engineering and Maintenance*.

Edward Alfred Simmons was born in Brooklyn, N. Y., on March 20, 1875, and was educated in the public schools of that borough. He entered the service of the Railroad Gazette in a subordinate capacity in September, 1889, where his ability was soon recognized and, in spite of his youth, it was not long until he attained an important post on the sales staff of the magazine, from which he was subsequently promoted to the business managership. In 1908 the Railroad Gazette was consolidated with the old Railway Age, and Colonel Simmons participated in the organization of the Simmons-Boardman Publishing Company, of which he became president three years later. In 1929 he was also elected president of the Simmons-Boardman Publishing Corporation, which was organized for the purpose of consolidating the ownership of a number of publications.

During the World War Colonel Simmons served with the Quartermaster Corps, being commissioned a major in 1918. After the war he was elevated to a lieutenant-colonelcy and later to a colonelcy in the Officers' Reserve Corps, Quartermaster section. He also had a prominent part in the work of several military organizations and was a member of several engineering societies. Colonel Simmons' career was an ever-expanding one, involving a pressure of work which latterly put a strain upon even such a vigorous constitution as was his.

Samuel O. Dunn was born on March 8, 1877, at Bloomfield, Iowa. When 12 years of age, he began to learn the printers' trade and at 18 was editor and publisher of a newspaper at Quitman, Mo. For the following eight years he was associated successively with the Maryville (Mo.) Tribune, the Kansas City Journal and the Chicago Tribune. Mr. Dunn's connection with the organization of which he is now the head began in January, 1907, when he was appointed an associate editor of the old Railway Age. A few months later he was made managing editor, and on June 1, 1908, when the old Railway Age and the Railroad Gazette were consolidated to form the Railroad Age Gazette, he was appointed western editor. He was appointed editorial director in 1910, and on October 1, 1911, editor. He has also served as editor-in-chief of all the other papers acquired and published.

Mr. Dunn has been constantly sought as a contributor to magazines and as a speaker on transportation subjects. He is also the author of "The American Transportation Question," "Government Ownership of Railroads" and "Regulation of Railways." He is a member of the Railroad committee and also of the Inland Waterway Transportation committee of the Chamber of Commerce of the United States, and is a former president of the Associated Business Papers, Inc. In addition to his duties as chairman of the board of the Simmons-Boardman Publishing Company, Mr. Dunn will continue as editor of the Railway Age.

Henry Lee was born at Hamlet, Ill., on May 25, 1884, and received his education at the Aledo, Ill., high school and at the Metropolitan Business College at Chicago. He joined the old Railway Age at Chicago in 1905, and was assigned to the news staff in 1906. A year later he was appointed associate editor and transferred to New York. Upon the consolidation of the Railway Age and the Railroad Gazette in 1908, Mr. Lee was transferred back to Chicago, and a year later was placed in charge of the make-up department at New York. Later in 1909, Mr. Lee was placed in charge of the copy service department, shortly after which he was made a sales representative of the company. He was elected secretary in 1910 and also treasurer in 1911. Mr. Lee was elected a director of the Simmons-Boardman Publishing Company in 1912 and became vice-president in 1916, at which time he was placed in active charge of the business department. In 1929, he was elected vice-president, director and member of the executive committee of the Simmons-Boardman Publishing Corporation.

Mr. Lee has been active in various organizations, having held office in the Federation of Trade Press Association (now the Associated Business Papers, Inc.), the New York Business Publishers' Association and the Technical Publicity Association.

Edward A. Simmons

Samuel O. Dunn

Henry Lee

ASSOCIATION NEWS

Wood-Preservers' Association

Members of the Executive committee met at St. Louis, Mo., on October 20. Attention was given primarily to the completion of the program for the next annual convention which will be held at St. Louis on January 26-28, 1932. President Penney was authorized to appoint a committee to investigate the inflammability of creosoted timber and to formulate precautions to reduce the hazards.

National Railway Appliances Association

The National Railway Appliances Association decided, at a meeting of its board of directors at Chicago on October 26, to abandon its twenty-fourth annual exhibit which was scheduled to be held at the Coliseum, Chicago, on March 14-17, 1932. An annual meeting for the election of officers and the transaction of other business will be held at the office of the association on Monday, March 14, 1932.

International Railway Maintenance Club

The International Railway Maintenance Club, until recently the International Track Supervisors' Club, will hold its next meeting on Thursday, November 12 at the Hotel Statler, Buffalo, N. Y. Following luncheon, which will be served at 12:30 p. m., the meeting will be addressed by Marvin B. Morrison of the Morrison Railway Supply Company, Buffalo.

As a result of the change in the name of the club to broaden its purpose and scope, membership in the club is now being offered to men in the signal, water service and bridge and building departments of the railways, and also to maintenance men of electric railway lines.

Maintenance of Way Club of Chicago

The eleventh annual dinner of the club was held at the Auditorium Hotel on October 21, with an attendance of 61 members and guests. The speaker of the evening was W. E. Fuller, assistant to executive vice-president of the Chicago, Burlington & Quincy, whose subject was "The Roadmaster in His Relation to the Present Railway Crisis." The following officers were elected: President, J. P. Corcoran, roadmaster, Alton, Bloomington, Ill.; first vice-president, C. T. Kimbrough, general roadmaster, I. H. B., Hammond, Ind.; second vice-president, H. R. Clarke, general inspector permanent way, C. B. & Q., Chicago; secretary and treasurer (re-elected) W. S. Lacher, managing editor, *Railway Engineering and Maintenance, Chicago;* members of the Executive committee for 2 years: J. S. Wincrantz, district manager, Hubbard & Co., Chicago; John J. Davis, supervisor of track, E. J. & E., Joliet, Ill.; and T. H. Strate, engineer track elevation, C. M. St. P. & P., Chicago. The club was shown to be on a sound condition.

Track Supply Association

The Track Supply Association has adopted a resolution outlining a program of legislation for placing unregulated and subsidized transportation agencies on a basis of equal competition with the railways. A general committee has been appointed to supervise all activities looking to the consummation of this program and already has held a meeting for the purpose of outlining a method of attack. Subcommittees are being organized at various points throughout the country. The program will be to influence public opinion to the ultimate end of having the desired legislation enacted. The Track Supply Association also solicits the cooperation of all individuals and organizations interested in seeing this program placed into effect.

American Railway Engineering Association

Committee activity was pronounced in October, 13 committees having held meetings during the month, while the Board of Directors of the Electrical Section of the American Railway Association also held a meeting at Philadelphia, Pa., on October 29. On October 5 and 6 the Committee on Yards and Terminals held a meeting at Pittsburgh, Pa., while the Committee on Work Equipment met at Chicago on October 6. The Committee on Iron and Steel Structures met at Washington, D. C., on October 8 and 9. A meeting of the Rivers and Harbors committee was held at Chicago on October 13, followed by a meeting of the Committee on Water Service and Sanitation at the same place on October 14 and 15. The Committee on Records and Accounts also met on October 15, at Pittsburgh. Two committees, those on Wooden Bridges and Trestles and on Ballast, met at Chicago on October 16.

Four committees held meetings during the following week, these being the Committee on Wood Preservation, at St. Louis, Mo., on October 20; the Committee on Shops and Locomotive Terminals, at Detroit, Mich., on October 20 and 21; the Committee on Economics of Railway Operation, at Pittsburgh on October 22; and the Committee on Rules and Organization, at Chicago on October 23. The last meeting of the month was that of the Committee on Roadway, at Chicago on October 26 and 27.

Only one committee has as yet scheduled a meeting for November, this being the Committee on Masonry, which will meet at Chicago on November 5 and 6.

An important meeting of the Board of Direction is scheduled to be held in Chicago on November 4.

PERSONAL MENTION

General

L. L. Morton, superintendent of the Montgomery and New Orleans division of the Louisville & Nashville, and a man of broad training and experience in the engineering field, has been promoted to assistant general manager, with headquarters at Louisville, Ky.

Raymond Swenk, superintendent of the Philadelphia Terminal division of the Pennsylvania, and an engineer by training and experience, has been promoted to general superintendent of the Northwestern division, with headquarters at Chicago. Mr. Swenk has been associated with the Pennsylvania throughout his entire railway career of 24 years. He was born on January 3, 1886, at Sunbury, Pa., and graduated from Pennsylvania State College in 1907. In June of that

Raymond Swenk

year, he entered the service of the Pennsylvania as a rodman on the engineering corps of the Sunbury division, and in 1909, he was transferred to the Conemaugh division. In 1913, Mr. Swenk was advanced to the position of transitman in the office of the chief engineer maintenance of way, and in another year, he was promoted to assistant supervisor, in which position he served successively on the Delaware, Atlantic and Philadelphia Terminal divisions. After four years, he was further advanced to supervisor on the Schuylkill division, with headquarters at Norristown, Pa., later being transferred to the Philadelphia division at Middletown, Pa., and then to Paoli, Pa. From February to June, 1927, Mr. Swenk served as engineer maintenance of way of the Southern division, with headquarters at Wilmington, Del. In June, 1928, he was advanced to division superintendent at New Castle, Pa., being transferred to the Cleveland division in June, 1929, with headquarters at Cleveland, Ohio. Last January, Mr. Swenk

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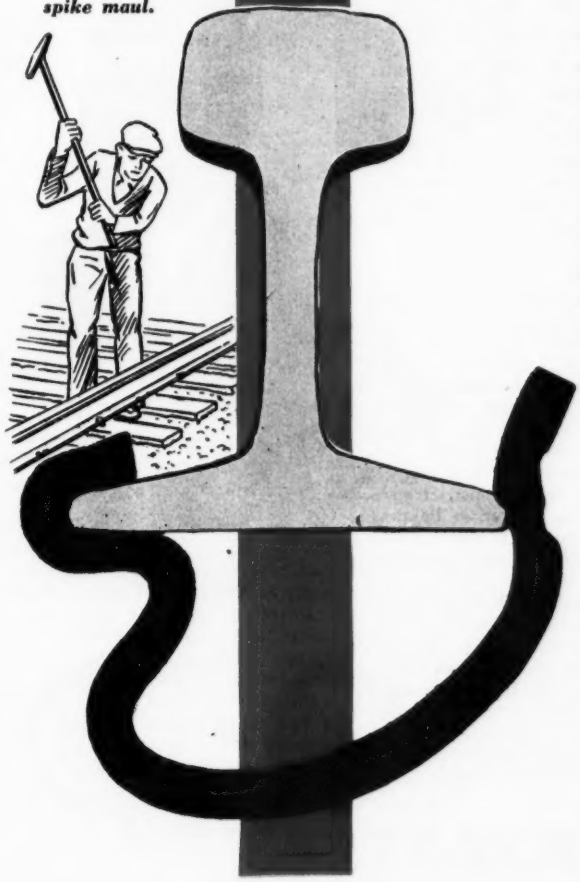

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was transferred to the Philadelphia Terminal division, with headquarters at West Philadelphia, Pa., where he was located at the time of his recent promotion to general superintendent.

J. D. Farrington, general superintendent of the Central district of the Chicago, Burlington & Quincy, who has gained much of his railway experience in the maintenance of way department, has been promoted to general manager of the Ft. Worth & Denver City and the Wichita Valley (subsidiaries of the Burlington), with headquarters at Ft. Worth, Tex. Mr. Farrington was born on January 27, 1891, at St. Paul, Minn., and after a high school education, entered the service of the Great Northern in June, 1909, where he served in the engineering department. A year later he left this road to become a timekeeper on the Bur-

J. D. Farrington

lington, where he subsequently served as an assistant foreman and foreman in the track department. In 1912, he was promoted to roadmaster and served until 1917 in this capacity and as an assistant trainmaster and trainmaster. In that year he left the railroad to serve in the World War with the United States Army, where he was consecutively a lieutenant, a captain and a major. After the war, he returned to the Burlington as assistant superintendent of the Ottumwa division, later serving on the staff of the federal manager of this road. From 1920 to 1922, Mr. Farrington was superintendent on the Quincy, Omaha & Kansas City (part of the Burlington), with headquarters at Kansas City, Mo., being in the latter year appointed superintendent of the St. Joseph division of the Burlington. He was transferred to the Aurora division in 1923, where he remained until January, 1930, when he was appointed general superintendent of the Missouri district, with headquarters at St. Louis, Mo. Early this year, when the Missouri and Iowa districts were combined to form the Central district, Mr. Farrington was made general superintendent of the new district, with headquarters at Burlington, Iowa, where he remained until his recent promotion, effective October 1.

Engineering

F. A. Jones, division engineer of the Little Rock division of the Missouri Pacific, has had his jurisdiction extended to include the Louisiana division, with headquarters at Monroe, La., succeeding **G. S. Smith,** who has been appointed assistant engineer at Little Rock, Ark.

Following the abolition of the Michigan division of the Cleveland, Cincinnati, Chicago & St. Louis, **C. W. Engle,** division engineer of this division, with headquarters at Wabash, Ind., has been transferred to the Northern division, with headquarters at Van Wert, Ohio, succeeding **W. D. Williams,** who has been appointed consulting engineer at the same point.

Irving Anderson, division engineer of the Kansas City division of the Atchison, Topeka & Santa Fe, with headquarters at Argentine (Kansas City), Kan., has been transferred to the Southern Kansas division, with headquarters at Chanute, Kan., succeeding **D. M. Rankin,** who has been appointed office engineer at the same point. **M. V. Holmes,** division engineer of the Missouri division, with headquarters at Marceline, Mo., has had his jurisdiction extended to include the Kansas City division, and the position of division engineer of the latter division has been abolished.

H. T. Livingston, engineer of construction of the Chicago, Rock Island & Pacific, with headquarters at Chicago, has been appointed division engineer of the Arkansas-Louisiana division with headquarters at Little Rock, Ark. Mr. Livingston succeeds **S. L. McClanahan,** who has been transferred to the Oklahoma-Southern division, with headquarters at Ft. Worth, Tex., where he replaces **A. H. Sturdevant,** who has been assigned to other duties. The position of engineer of construction has been discontinued. These changes became effective on October 15.

F. M. Thomson, district engineer of the North Texas district of the Missouri-Kansas-Texas, at Denison, Tex., has been transferred to Parsons, Kan., with jurisdiction over the St. Louis, Parsons and McAlester districts. **J. J. Gallagher,** district engineer of the South Texas district, at Smithville, Tex., has had his jurisdiction extended to include the North Texas district, with headquarters at Denison. **R. C. Dunlay,** district engineer of the Parsons district, at Parsons, Kan., has been assigned to other duties. The positions of district engineer of the St. Louis and McAlester districts, held by **W. W. Marshall,** at Boonville, Mo., and **W. C. Pruett,** at Muskogee, Okla., have been abolished and Mr. Marshall and Mr. Pruett have been assigned to other duties. **N. W. Brown,** assistant engineer in the office of the chief engineer, has been appointed to the newly-created position of industrial engineer, with headquarters as before at St. Louis, Mo.

Following the consolidation of the Iowa and Minnesota divisions of the Illinois Central into one division, known as the Iowa division, **W. R. Gillam,** division engineer of the Iowa division, with headquarters at Ft. Dodge, Iowa, has been appointed to the same position on the new division with headquarters at Waterloo, Iowa. **H. Rhoads,** division engineer of the Minnesota division, with headquarters at Dubuque, Iowa, has been assigned to other duties. **J. M. Harper,** division engineer of the New Orleans division, has moved his headquarters from Baton Rouge, La., to Vicksburg, Miss., where he has jurisdiction over the same territory, following the consolidation of the New Orleans and Vicksburg Route divisions into one division, known as the Vicksburg division. **C. J. Carney,** division engineer of the former Vicksburg Route division, with headquarters at Vicksburg, Miss., retains his position on the new division with the same headquarters.

E. L. Crugar, engineer of construction of the Illinois Central, with headquarters at Chicago, has been appointed chief engineer of the Wabash, with headquarters at St. Louis, Mo., to fill a position that has been held vacant for some time. **W. R. Bennett,** chief engineer maintenance of way, with headquarters at St. Louis, Mo., has been appointed division engineer on the Ann Arbor (a subsidiary of the Wabash), with headquarters at Owosso, Mich., succeeding **R. D. Copeland,** who has been appointed first assistant engineer at the same point. The

E. L. Crugar

position of chief engineer maintenance of way of the Wabash has been abolished and the duties have been assumed by Mr. Crugar.

Mr. Crugar was born on November 4, 1879, at Saline City, Mo., and was educated at Prichett College and the University of Wisconsin. During vacations, he served as chainman and later as a rodman and masonry inspector on the Chicago & Alton (now the Alton). In April, 1902, he was appointed chief clerk to the chief engineer of the Knoxville, La Follette & Jellico (now part of the Louisville & Nashville), and until March, 1906, he served in this position and as resident engineer and assistant engineer on the same road. Mr. Crugar then returned to the Chicago & Alton as chief clerk to the chief engineer, being appointed assistant engineer in charge of

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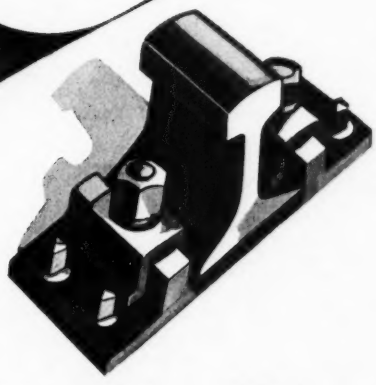

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construction two years later. After two years in this position, he was further promoted to assistant chief engineer, with headquarters at Chicago. He left the service of the Alton in April, 1914, to accept a position as assistant engineer on the Illinois Central, being promoted to district engineer, with headquarters at New Orleans, La., in December, 1915. Mr. Crugar held this position until the early part of 1923, when he was promoted to engineer of construction, at Chicago, which position he retained until his recent appointment as chief engineer of the Wabash, effective October 16.

John L. Campbell, chief engineer of the Northwestern Pacific (a subsidiary of the Southern Pacific), with headquarters at San Francisco, Cal., has retired from active service and his duties have

John L. Campbell

been taken over by **W. H. Kirkbride,** engineer maintenance of way and structures of the Southern Pacific, Pacific System.

Of his engineering career of 43 years, Mr. Campbell has spent about 37 years in railway work. He was born in Illinois in 1863, and when 25 years of age he went to El Paso, Tex., where he began his engineering career as a surveyor in Western Texas and New Mexico. After several years of miscellaneous engineering work, Mr. Campbell was appointed engineer of construction of the Rio Grande Northern (operation discontinued) in 1895, and in 1896, he became locating engineer of the Rio Grande, Sierra Madre & Pacific (now the Mexico North Western). In 1897, he was appointed chief engineer on location and construction of the El Paso & Northeastern (now part of the Southern Pacific), subsequently going with the Atchison, Topeka & Santa Fe and later with the Arizona & New Mexico (now part of the Southern Pacific). He was chief engineer of the St. Louis, Kansas City & Colorado (now part of the Chicago, Rock Island & Pacific) during its construction between St. Louis, Mo., and Kansas City. From August, 1904, until early in 1905, he was engaged on a survey for the Phelps-Dodge Corporation, New York, for the construction of a railway from El Paso to a coal field in the San Juan River valley. In the latter year, he was made engineer maintenance of way of the El Paso & Southwestern, being appointed chief engineer in 1920. Following the consolidation of this road with the Southern Pacific in November, 1924, Mr. Campbell was appointed assistant to the chief engineer of the Southern Pacific, with headquarters at San Francisco, being assigned to valuation work. On August 26, 1928, he was appointed acting chief engineer of the Northwestern Pacific, with headquarters at the same point, being appointed chief engineer about a month later, a position he retained until his retirement. Mr. Campbell has been active in the affairs of the American Railway Engineering Association, of which organization he was president in the fiscal year 1922-23.

Robert R. Cummins, superintendent of the Savannah division of the Central of Georgia, has been appointed superintendent maintenance of way, a newly-created position, with headquarters as before at Savannah, Ga. Mr. Cummins was born on September 30, 1884, at Marion, Ala., and graduated from the University of Alabama in 1906. He served for a time as a rodman, levelman and transitman on the Seaboard Air Line, and from July, 1907, until August, 1909, was a transitman and a resident engineer on the Georgia & Florida, on surveys and construction work from Vidalia, Ga., to Madison, Fla. On August 27, 1909, Mr. Cummins entered the service of the Central of Georgia, as a

Robert R. Cummins

draftsman in the chief engineer's office. From January 1, 1912, until January 15, 1914, he served as assistant engineer, and then became pilot engineer on government valuation, which position he held until June 1, 1916. He then became supervisor of bridges and buildings of the Southwestern division, being transferred to the Columbus division on January 20, 1917. On July 1, 1918, Mr. Cummins was appointed roadmaster of the Macon division, and about a month later he was commissioned first lieutenant in the engineers' overseas service, being mustered out of service in July, 1919. On was appointed assistant trainmaster on the Columbus division of the Central of Georgia, and became roadmaster of the Southwestern division on February 1, 1920. On January 15, 1925, he was transferred to the Columbus division, and in December, 1927, he was appointed superintendent of the Savannah division, which position he held until his recent promotion.

J. K. Sherman, assistant engineer in the office of the chief engineer maintenance of way of the Western region of the Pennsylvania, with headquarters at Chicago, has been appointed assistant to the division engineer, at Ft. Wayne, Ind., succeeding **J. W. Quick,** who has been assigned to other duties. **H. W. Brown,** also assistant engineer in the office of the chief engineer maintenance of way, at Chicago, has been appointed assistant to the division engineer at Indianapolis, Ind., succeeding **F. N. Crowell,** who has also been assigned to other duties.

David R. Mehaffey, assistant tunnel engineer in the office of the chief engineer, New York zone of the Pennsylvania, with headquarters at New York, was retired on October 1, after serving that road for more than 46 years in various engineering capacities. Mr. Mehaffey was born at Marietta, Pa., and was graduated from the University of Pennsylvania with the degree of civil engineer in 1885. On June 10 of that year he entered the employ of the Pennsylvania as a chainman in the engineering corps of the chief engineer's department, at Philadelphia. In 1888, he was appointed assistant supervisor at Tyrone, Pa., and later served in that capacity at New Brunswick and Jersey City, N. J. In 1890, he was promoted to supervisor, with headquarters at Tacony, Pa., and in 1900 he was promoted to assistant engineer. From 1908 to 1911 he assisted in the construction of the Pennsylvania station at New York, and following the completion of the station, was in charge of many changes in the road's facilities in and about New York. On July 1, 1921, he was appointed assistant tunnel engineer, with headquarters at Philadelphia, and on October 16, 1928, was transferred to the office of the chief engineer, New York zone, with headquarters at New York.

Track

Oliver Dawson, roadmaster on the Michigan Central, with headquarters at St. Thomas, Ont., has retired from active service, after nearly 50 years with this road. The position of roadmaster at St. Thomas has been abolished and the territory distributed among other roadmasters.

B. Akers, track supervisor on the Louisville & Nashville, with headquarters at Winchester, Ky., retired from active service on October 1, at the age of 70 years. Mr. Akers entered railway service on July 6, 1888, as a track foreman on the Lexington & Eastern (now part of the L. & N.), and in 1897, he was promoted to roadmaster. He was appointed track supervisor on January 1,

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1913, which position he occupied continuously until his retirement.

J. N. Fuller, assistant engineer on the Southern Pacific Lines in Texas and Louisiana, with headquarters at Austin, Tex., has been appointed acting roadmaster on the Austin division, with the same headquarters, to succeed **A. Atwood. H. L. Pruett** has been appointed acting roadmaster on the Terminals division, with headquarters at Houston, Tex., to succeed **Walter H. Raleigh,** whose death was noted in the October issue.

W. T. Hall, supervisor of track on the Louisville & Nashville, with headquarters at Pennington, Va., has retired from active service. The following supervisors of track have been assigned to other duties and their positions abolished: **S. Irvine,** Paris, Ky.; **W. T. Brooks,** Brodhead, Ky.; **J. B. Bramlett,** Marietta, Ga.; **C. M. Weir,** Nashville, Tenn.; **R. R. Scott,** Birmingham, Ala.; and **W. L. Watson,** Alabama City, Ala.

Following the absorption of the Spartanburg division of the Southern by the Columbia division, **G. G. Hewitt,** roadmaster of the latter division, with headquarters at Columbia, S. C., has had his jurisdiction extended to include the former division. **J. H. Blackwell,** roadmaster of the Asheville division, with headquarters at Asheville, N. C., has been appointed assistant roadmaster on the Columbia division, with headquarters at Spartanburg, S. C., succeeding **T. F. King,** roadmaster of the former Spartanburg division, who has been transferred to Asheville, to succeed Mr. Blackwell.

Following the absorption of the Cascade division of the Great Northern by the Spokane division, **T. Riley,** roadmaster of the former division, with headquarters at Seattle, Wash., has had his jurisdiction extended to include the Spokane division, with headquarters at Spokane, Wash. The Montana division has been absorbed by the Butte and Kalispell divisions, and **A. Mitguard,** roadmaster of the Montana division, with headquarters at Havre, Mont., has been transferred to the Butte division, with headquarters at Great Falls, Mont., succeeding **T. R. Connors.**

In accordance with the new system of track supervision that is being established on the Chicago, Burlington & Quincy, positions of supervisor are being created at various points and the territories of roadmasters are being lengthened. The supervisors have jurisdiction over about 70 miles of track and where roadmasters are appointed supervisors, the positions of roadmaster are abolished and the territories distributed among other roadmasters. **E. D. Hoenshell,** roadmaster on the Omaha division, with headquarters at Fremont, Neb., has been appointed supervisor at the same point. **M. W. Stevens,** roadmaster on the McCook division, with headquarters at McCook, Neb., has been appointed supervisor on the Omaha division, with headquarters at Omaha, Neb. **W. W. Slack,** roadmaster on the Lincoln division, with headquarters at Sutton, Neb., has been appointed supervisor, with headquarters at the same point. **W. E. Waygood,** roadmaster on the Casper division, with headquarters at Casper, Wyo., has been appointed supervisor, with headquarters at Guernsey, Wyo. **T. O'Neil,** roadmaster on the same division, with headquarters also at Casper, has been assigned to other duties. **H. W. Freeman,** roadmaster on the Sterling division, with headquarters at Bridgeport, Neb., has been appointed supervisor, with headquarters at Guernsey.

Bluford Violett, whose retirement as general roadmaster of the Ft. Worth & Denver City (a subsidiary of the Chicago, Burlington & Quincy), was noted in the October issue, has served a total of 54 years with the Burlington and its subsidiaries, 15 years of which have been

Bluford Violett

as a roadmaster and 11 years as general roadmaster. Mr. Violett was born on December 24, 1857, at Winchester, Ill., and entered the service of the Burlington at that point on October 1, 1877, as a trackman. Four years later he was promoted to track foreman at Merritt, Ill., and until 1905, he served alternately in this capacity and as extra gang foreman, being in that year promoted to division roadmaster, with headquarters at Beardstown, Ill. He remained at that point until 1920, when he was sent to Ft. Worth, Tex., as general roadmaster of the Ft. Worth & Denver City. Mr. Violett occupied this position continuously until his retirement on September 1 of this year.

Following a general re-arrangement of track supervisors' territories on the New York Central, Lines West of Buffalo, in which several subdivisions were eliminated, there have been a number of changes among supervisors. **C. L. Nolan,** supervisor, with headquarters at Streator, Ill., has been appointed to the newly-created position of supervisor at Chicago, and has been succeeded by **C. H. Rachor,** supervisor, with headquarters at White Pigeon, Mich., the position of supervisor at White Pigeon having been abolished. **R. R. Rex,** supervisor, with headquarters at Gibson, Ind., has been appointed assistant supervisor at the same point, the position of supervisor at Gibson having also been abolished. **H. H. Britton,** supervisor at Hillsdale, Mich., has been transferred to Franklin, Pa., succeeding **C. W. Thornton,** who has been appointed assistant supervisor, with headquarters at Elkhart, Ind. The position of supervisor at Hillsdale has been discontinued.

C. C. McQuire, roadmaster on the Southern Kansas division of the Atchison, Topeka & Santa Fe, with headquarters at Moline, Kan., has been transferred to Independence, Kan., on the same division, succeeding **A. N. Ferguson,** who has been transferred to the Middle division, with headquarters at Abilene, Kan., where he succeeds **W. C. Peters,** who has been assigned to other duties. The position of roadmaster at Moline has been abolished. **E. N. Forrester,** assistant roadmaster, with headquarters at Henrietta, Mo., has been appointed roadmaster at Argentine (Kansas City), Kan., and the position of assistant roadmaster at Henrietta has also been abolished. **E. K. McNeil,** roadmaster with headquarters at Pueblo, Colo., has been transferred to Satanta, Kan., succeeding **O. W. Thurston,** who has been assigned to other duties.

R. G. Ford, assistant engineer in the office of the chief engineer maintenance of way of the Pennsylvania, with headquarters at Philadelphia, Pa., has been appointed supervisor on the Philadelphia division, with headquarters at Middletown, Pa., to succeed **H. H. Pevler,** who has been transferred to the Baltimore division, with headquarters at Washington, D. C., where he relieves **J. J. Clutz,** who has been transferred to the Middle division, at Hollidaysburg, Pa. **C. R. Gerard,** supervisor on the Atlantic division, at Mt. Holly, Pa., has been transferred to Woodbury, N. J., on the same division. **C. L. Snavely,** assistant supervisor on the Sunbury division, with headquarters at Wilkes-Barre, Pa., has been transferred to the Philadelphia division at Columbia, Pa., where he succeeds **A. R. Mahaney,** who has been transferred to the Atlantic division, with headquarters at Woodbury, N. J. **D. R. Mehl,** supervisor on the Atlantic division with headquarters at Millville, N. J., has been transferred to the Sunbury division, at Wilkes-Barre, Pa., where he replaces **C. D. Merrill,** who has been appointed assistant supervisor on the Philadelphia division, at Downington, Pa. **W. S. Springer,** supervisor in the office of the chief engineer maintenance of way, has been transferred to the Cumberland Valley division, with headquarters at Chambersburg, Pa., where he succeeds **H. D. Kruggel,** who has been transferred to the Delmarva division, with headquarters at Harrington, Del., replacing **J. D. Morris,** who has been transferred to the Williamsport division, at Lock Haven, Pa. **N. vR. Hunter,** division engineer on the Cumberland Valley division, has been appointed supervisor on the Middle division, with headquarters at Huntingdon, Pa., succeeding **F. H. Lewis,** who has been transferred to the Middle division, with headquarters at Newport, Pa., where he relieves **J. L. Lewis,** who has been transferred to the Philadelphia Terminal division, with headquarters at

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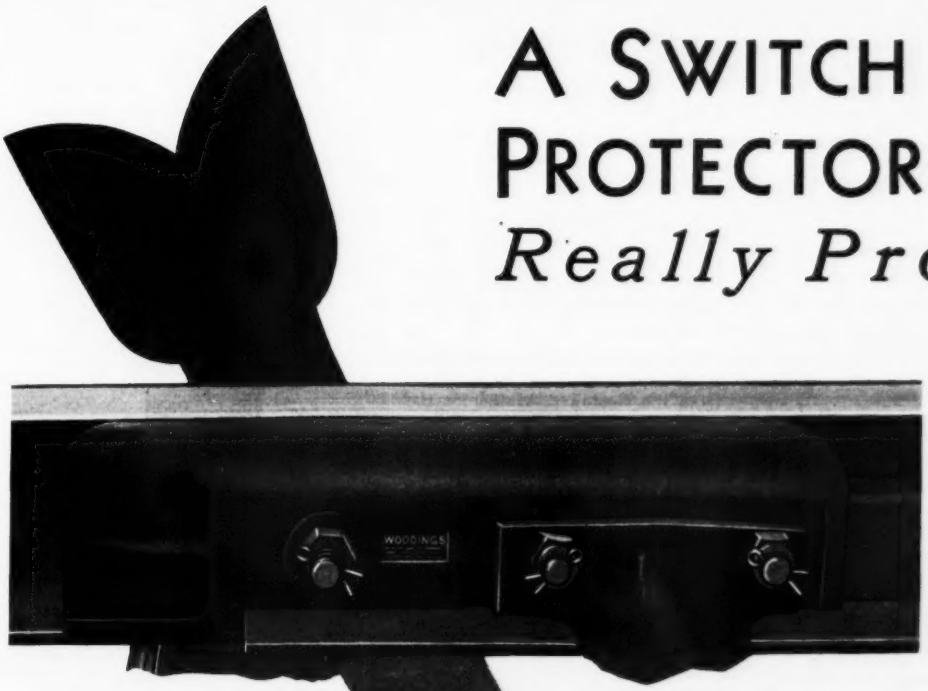

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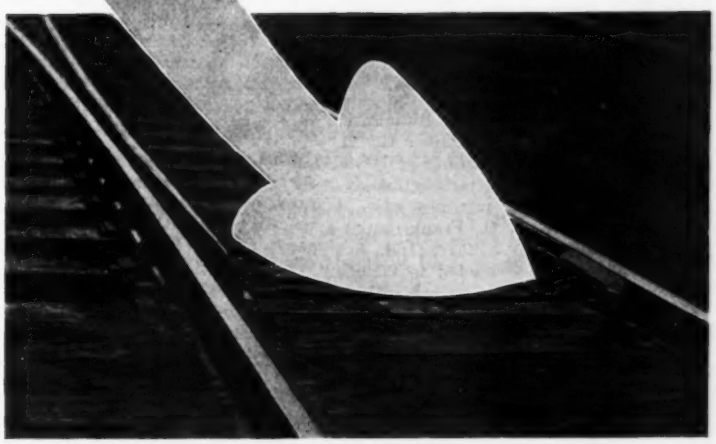

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South Philadelphia. Mr. Lewis succeeds **R. S. Dunkle,** who has been transferred to the Sunbury division, with headquarters at Sunbury, Pa., to succeed **P. M. Roeper,** who has been appointed assistant supervisor on the Philadelphia division, with headquarters at Middletown, Pa. **E. G. Adams,** assistant supervisor on the Middle division, with headquarters at Hollidaysburg, has been transferred to the Schuylkill division.

Bridge and Building

T. H. Gray, master carpenter of the Conemaugh division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has had his jurisdiction extended to include the Monongahela division. **W. F. Rankin,** master carpenter of the latter division, with headquarters at Uniontown, Pa., has retired.

Robert Huebel, bridge gang foreman on the San Antonio division of the Southern Pacific Lines in Texas and Louisiana, has been promoted to bridge and building supervisor on the same division, with headquarters at San Antonio, Tex., to succeed **C. Black,** who has been transferred to the El Paso division, with headquarters at El Paso, Tex., where he displaces **J. C. Hunt,** who has been assigned to other duties.

Coincident with the absorption of the St. Cloud division of the Great Northern by the Mesabi, Dakota and Willmar divisions, **Julius Zinke,** master carpenter of the St. Cloud division, with headquarters at Minneapolis, Minn., has been transferred to the Willmar division, with headquarters at Willmar, Minn., succeeding **H. Bly.** The Montana division has been absorbed by the Butte and Kalispell divisions, and **S. E. Coleman,** master carpenter of the Montana division, with headquarters at Havre, Mont., has been transferred to the Butte division, with headquarters at Great Falls, Mont., where he succeeds **E. Johnson.**

Following the abolition of the positions of supervisor of buildings on the New York Central, Lines West of Buffalo, at Toledo, Ohio, and Ashtabula, **G. H. Frazine,** supervisor of buildings at Cleveland, Ohio, has had his jurisdiction extended to include all territory east of Toledo. Similarly, **J. G. Frank,** supervisor of buildings, at Elkhart, Ind., has had his jurisdiction extended to include all territory west of Toledo. **L. Birch,** supervisor of buildings, at Ashtabula, has been appointed assistant supervisor of buildings at Cleveland, and **C. S. Holden,** supervisor of buildings, at Toledo, has been appointed assistant supervisor of buildings, with headquarters at Elkhart.

Obituary

P. J. Hurlihe, track supervisor on the New York, New Haven & Hartford, with headquarters at Danbury, Conn., died at his home in Danbury on October 16.

William A. Balcom, who retired about a year ago as office engineer of the Denver & Rio Grande Western, with headquarters at Denver, Colo., died on October 15, at that place.

SUPPLY TRADE NEWS

General

The Chicago Pneumatic Tool Company, New York, has moved its offices and service station at Seattle, Wash., from 1743 to 3201 First Avenue, South, and **C. Kirk Hillman** has been appointed district manager.

The Ruby Railway Equipment Company, Philadelphia, Pa., has received an order from the **Boston & Maine** for the equipping with Vaughan gas switch heaters of 93 switches and 18 double slip switches at this road's new North Station at the Boston (Mass.) Terminal, at an expense of more than $25,000.

The Rockford Screw Products Company, Rockford, Ill., has been licensed by the **Dardelet Threadlock Corporation,** New York, to manufacture and sell bolts, nuts and screws threaded with the Dardelet self-locking thread. Manufacturing and selling licenses for the Dardelet thread have also been granted recently to **Wm. Gaskell & Son,** Brooklyn, N. Y.; to the **Harrison Bolt & Nut Co.,** Harrison, N. J., and to the **Standard Pressed Steel Company,** Jenkintown, Pa.

Personal

John A. Roche, 59 East Van Buren street, Chicago, has been appointed district representative in the Chicago territory for the **Syntron Company,** Pittsburgh, Pa.

Francis D. West, manager of sales of the Paradon Company, has returned to the service of the **Permutit Company,** New York, as district sales manager, with headquarters at 712 Brisbane building, Buffalo, N. Y. Mr. West was associated with the Permutit Company from 1918 until 1930.

G. A. W. Bell, Jr., railroad sales manager of the **Northwest Engineering Company,** has been appointed eastern representative of the **Caterpillar Tractor Company,** Peoria, Ill., with headquarters at Washington, D. C. **C. D. Turley,** assistant engineer on the chief engineer's staff of the Illinois Central, with headquarters at Chicago, has been appointed western representative of the same company, with headquarters at the same point. These men will devote their time to the promotion of Caterpillar equipment on the railways in their respective territories.

Charles H. Gayetty has been appointed manager of railway sales of the **Keasbey & Mattison Company,** Ambler, Pa. In the November issue of *Railway Engineering and Maintenance,* it was incorrectly reported that Mr. Gayetty had become associated with the **Louisville Frog, Switch & Signal Co.** Mr. Gayetty was born at Oil City, Pa., and was educated in the high schools of that city and also attended Temple University, Philadelphia, Pa. He began railway work in the operating department of the Pennsylvania at Oil City, and subsequently served in the freight department of the same road at its Broad Street station, Philadelphia, remaining with the Pennsylvania for a total of 11 years. Mr. Gayetty subsequently was in charge of sales of the railroad department of the

Charles H. Gayetty

Quaker City Rubber Company, Philadelphia. For the last five years he has been with the railroad department of the Boston Woven Hose & Rubber Company, Boston, Mass.

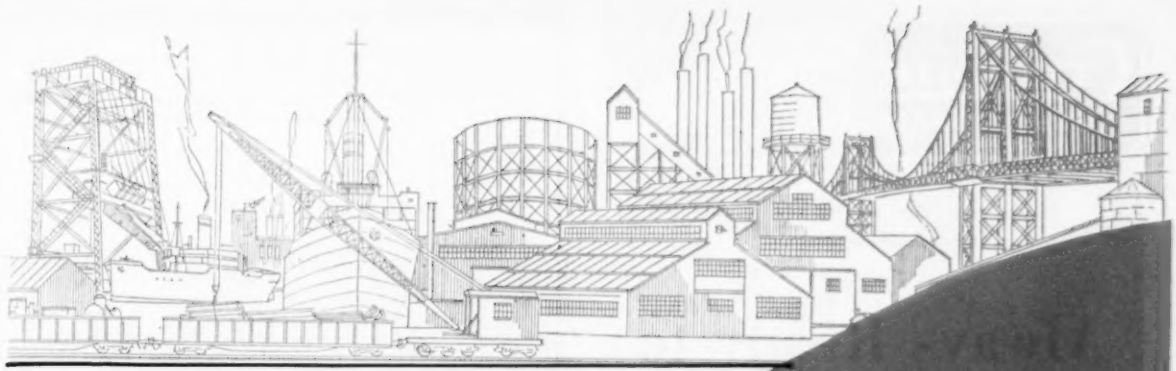
William T. Bentz has been appointed manager of sales of rail steel products, of the **Republic Steel Corporation,** Youngstown, Ohio. Mr. Bentz was formerly sales head of Steel & Tubes, Inc., a subsidiary of the Republic Steel Corporation. He will continue for the present to have his headquarters at Cleveland, Ohio.

Trade Publications

Caterpillar Tractors for Railroads.—This is the title of a 30-page booklet being distributed by the Caterpillar Tractor Company, Peoria, Ill., which describes and illustrates the many ways in which Caterpillar tractors are being applied to railway maintenance and construction work.

T-Tri-Lock.—The Carnegie Steel Company, Pittsburgh, Pa., has issued a 24-page pamphlet containing an exposition of a new form of highway bridge floor known as T-Tri-Lock, consisting of a grille of interlocked tees and bars. In addition to an illustrated description, the booklet contains detailed structural data on the physical properties necessary for the correct proportioning of floors in which this construction is employed.

Designing Pipe Lines for Pressure.—In Bulletin No. 3, Vol. 1, the American Rolling Mill Company, Middletown, Ohio, presents a chart for determining the wall thickness of pipes for various diameters and hydrostatic pressures, based on a working stress of 10,000 lbs. per sq. in. The text matter explains the use of the chart and points to the economy possible through the wide range of wall thicknesses available in Armco spiral welded pipe.



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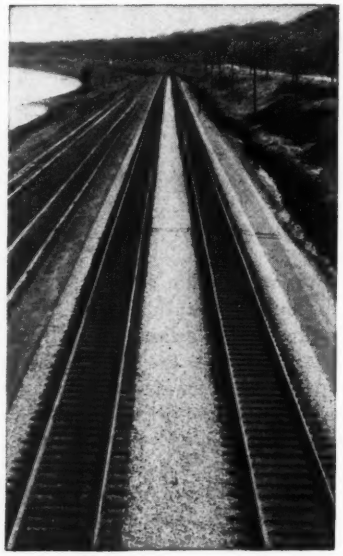

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STATEMENT of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of *Railway Engineering and Maintenance*, published monthly at Milwaukee, Wis., for October, 1931.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Elmer T. Howson, who, having been duly sworn according to law, deposes and says that he is the editor of the *Railway Engineering and Maintenance*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Simmons-Boardman Publishing Company, 30 Church St., New York, N. Y.

Editor, Elmer T. Howson, 105 West Adams St., Chicago, Ill.

Managing Editor, Walter S. Lacher, 105 West Adams St., Chicago, Ill.

Business Manager, F. C. Koch, 30 Church St., New York, N. Y.

2. That the owners are:

Simmons-Boardman Publishing Co., 30 Church St., New York, N. Y.; Simmons-Boardman Publishing Corporation, 30 Church St., New York, N. Y. Stockholders of 1 per cent or more of the total amount of stock are: E. A. Simmons, 30 Church St., New York, N. Y.; I. R. Simmons, 1625 Ditmas Ave., Brooklyn, N. Y.; P. A. Lee, Hopatcong, N. J.; H. Anderson, 246 Rugby Road, Brooklyn, N. Y.; E. G. Wright, 398 N. Walnut St., E. Orange, N. J.; S. O. Dunn, 105 W. Adams St., Chicago, Ill.; C. E. Dunn, 3500 Sheridan Rd., Chicago, Ill.; L. B. Sherman, 575 Sheridan Rd., Winnetka, Ill.; Mae E. Howson, 105 W. Adams St., Chicago, Ill.; Frederick H. Thompson, Terminal Tower, Cleveland, Ohio; B. L. Johnson, 105 W. Adams St., Chicago, Ill.; W. A. Radford, 407 So. Dearborn St., Chicago, Ill.; Spencer Trask & Company, 25 Broad St., New York, N. Y. Partners of Spencer Trask & Company are: E. M. Bulkley, Acosta Nichols, Cecil Barret, J. Graham Parsons, C. Everett Bacon, William R. Basset, F. Malbone Blodget, Percival Gilbert, Harry S. Allen, Harry A. Minton, William Beckers, W. V. C. Ruxton, Arthur H. Gilbert, all of 25 Broad St., New York, N. Y.; William E. Stanwood, 50 Congress St., Boston, Mass.; John Nightingale, 50 Congress St., Boston, Mass., and S. Bayard Colgate, Special Partner, 52 Wall St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

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ELMER T. HOWSON.

Sworn to and subscribed before me this 1st day of October, 1931. HELEN E. PITMAN.

[Seal] (My commission expires Sept. 4, 1932.)

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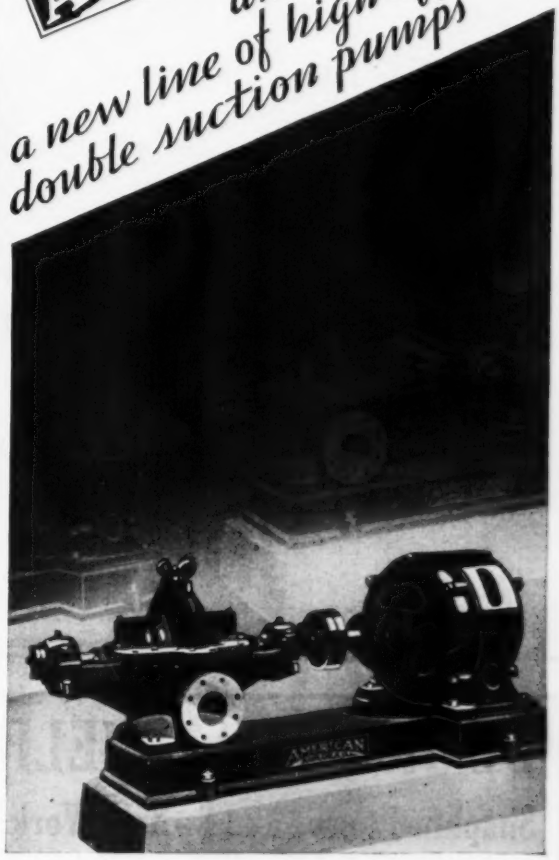

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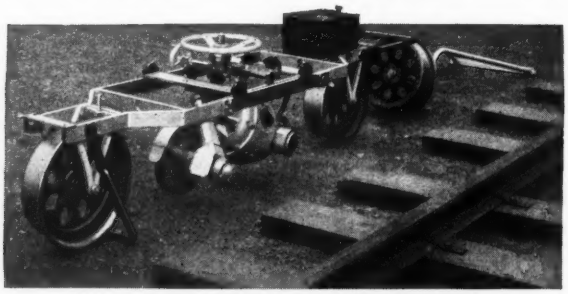

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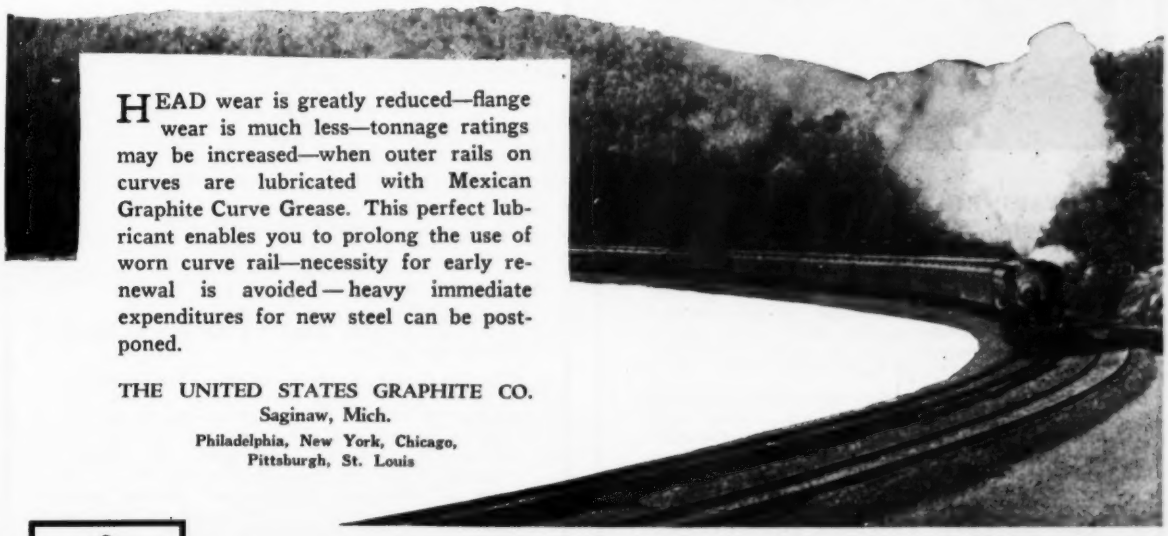

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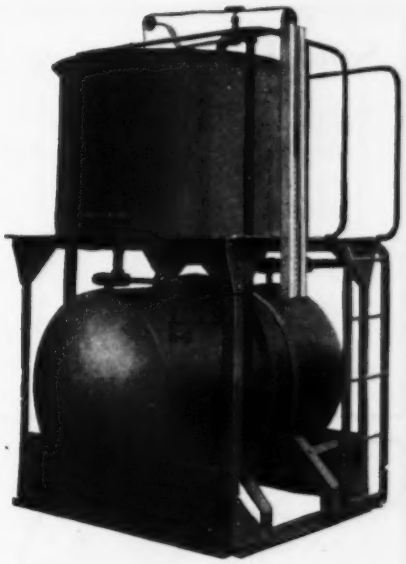

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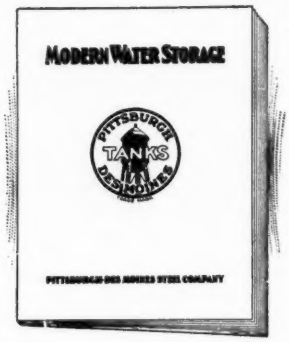

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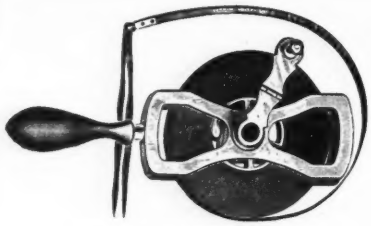

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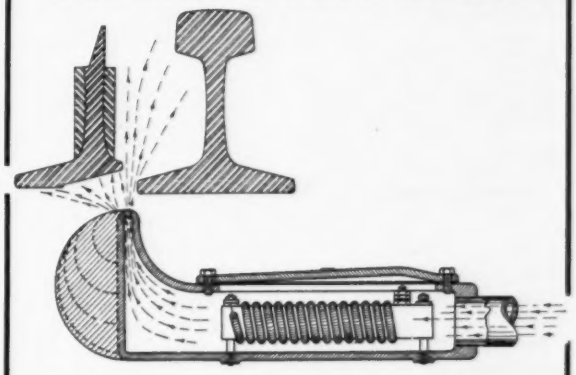

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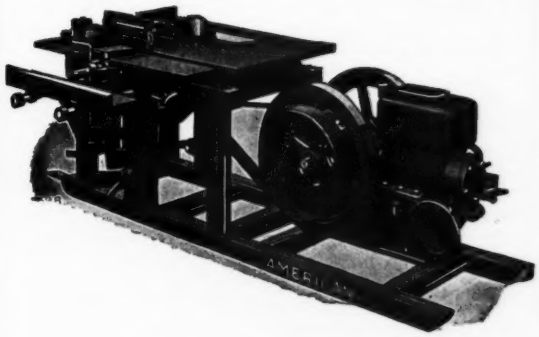

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See Tie Tampers.

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"The permanency of results of chemical weed killing as reported seems to warrant the conclusion that it is the most effective of any method. On roads where this method has been in use for several successive seasons, the vegetation appearing each year seems to be less and the cost of treatment materially decreases. It is thought that continued treatment may render ballast and embankment highly sterile, and thus discourage the growth of vegetation."

Published from Report of Roadway Committee, A.R.E.A., Nov., 1929 A.R.E.A. Bulletin.

"The opinion of this committee is that chemical treatment offers the best method of weed control and elimination in the roadbed section. It is economical, rapid and effective. It gives cleaner track over a longer period than any other method and does not interfere with other maintenance work during application. The lasting results permit the section forces to be utilized on important track work instead of controlling weeds, which is reflected in better track condition."

From Report of Weed Control and Elimination Committee, Roadmasters' and Maintenance of Way Ass'n., 1929.

The results of chemical weed killing treatment are cumulative. Vegetation gets less each year and the cost of treatment decreases annually. To let track go a year or two without treatment will undo the fine work already accomplished. Weed killing is a necessity. Don't neglect it for a temporary saving that will penalize you later many times over in increased maintenance costs.

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ALPHABETICAL INDEX TO ADVERTISERS

A

American Saw Mill Machinery Co. 1003
American Well Works 999

B

Baldwin-Southwark Corp. 938
Buckeye Traction Ditcher Co. 1002
Bucyrus-Erie Co. 943
Butler Mfg. Co. 939

C

Calcyanide Co. 1003
Carnegie Steel Co. 991
Caterpillar Tractor Co. 941
Chipman Chemical Eng. Co., Inc. 1007
Creepcheck Co. 989

D

Dearborn Chemical Co. 1001

F

Fairmont Railway Motors, Inc. 934-935

G

Gohi Culvert Mfrs., Inc. 949

I

Ingersoll-Rand Co. 940

J

Jackson Lumber Co. 1005

L

Layne & Bowler, Inc. 1005
Louisville Frog, Switch & Signal Co. 1003
Lufkin Rule Co. 1002
Lundie Engineering Corp. 933

M

Massey Concrete Products Corp. 950
Mechanical Mfg. Co. 999

N

National Aluminate Corp. 1003
National Lead Co. 997
National Lock Washer Co. 1009
Nordberg Mfg. Co. 944
Northwest Engineering Co. 937

O

Oxweld Railroad Service Corp. 946

P

P & M Co. 931
Pittsburgh-Des Moines Steel Co. 1002

Q

Q & C Co. 947

R

Railway Trackwork Co. 1000
Ramapo Ajax Corp. 952
Reliance Mfg. Co. 932

S

Simmons-Boardman Publishing Co. 998-1000-1002
Southern Wood Preserving Co. 998
Southwark Foundry & Machine Co. Div. 938
Syntron Co. 936

T

Timken Roller Bearing Co. 1010

U

U. S. Graphite Co. 1001

W

Woodings Forge & Tool Co. 993-995
Woodings-Verona Tool Works 945
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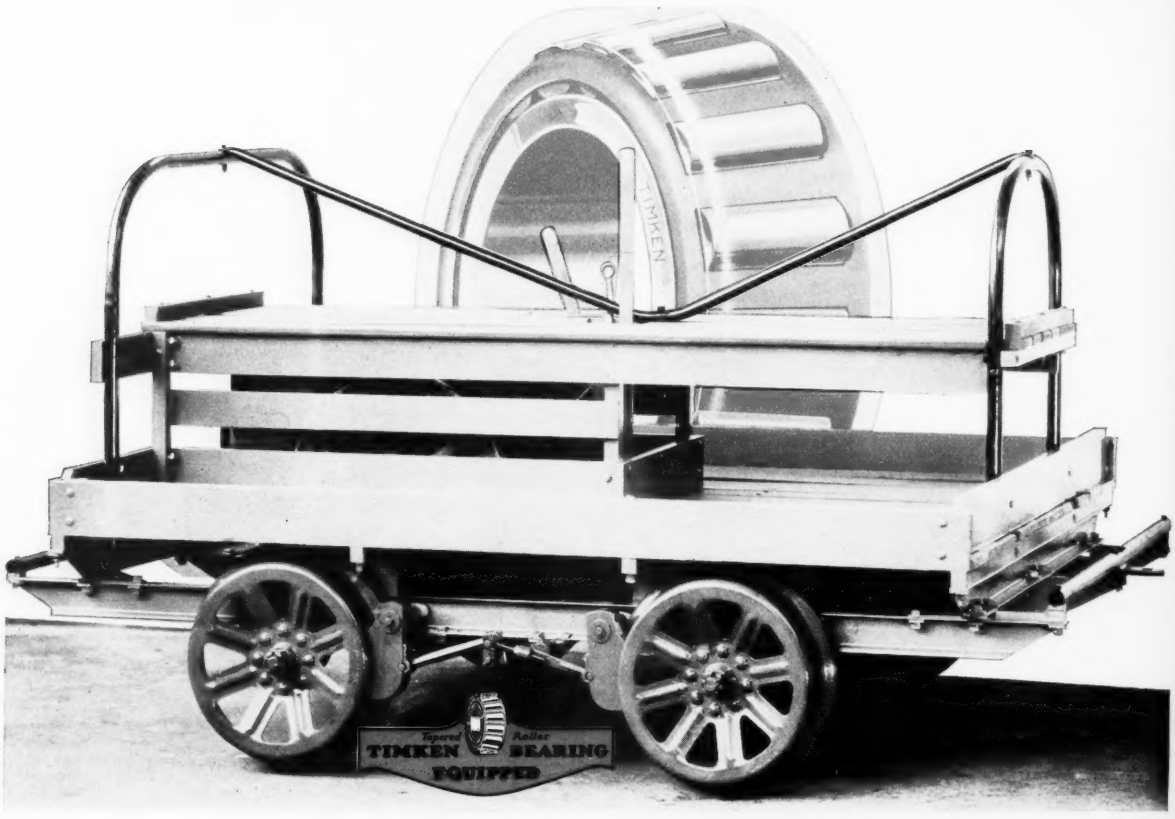

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